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The "Fitchburg" Automatic Variable Cut-off Steam Engine.

The Fitchburg engine, which will be found illustrated herewith, we think, will prove interesting to our electric-light people, as it seems to possess several features peculiar to itself, together with other improvements usually found in first-class engines. Of the very few high-speed engines which will meet the requirements in this particular field, this engine may be mentioned as one of them, as it has already proved from several severe tests in driving generators.

It is of that class of automatics with positive motion of valves, their travel and point of cut-off being automatically varied by shifting the eccentric upon the shaft, and can be run as slow or as fast as is desired. The piston valves are used and are absolutely balanced, being adjustable for all possible wear by very simple means, so that in ten minutes' time they can be made tight if by gravity there is any wear. But this is very slight, and the only wearing force, so that an adjustment once in six to twelve months is all that is needed. They will stay tighter than a common slide valve, are as simple, and can be kept tight at no expense. The company has used them for twelve years, and knows their value and capability, and at the same time how to make them properly for best results.

The steam valves and exhaust valves are entirely independent of each other in their action, the latter being moved by a simple eccentric, adjustable to give any desired closure and release. The steam valves are actuated through a wrist plate, which gives a sharp opening and closure of ports when taking and cutting off steam, and a free admission of steam at its full pressure.

The automatic governor upon the shaft changes the point of cut-off in accordance with the load, preserving a constant lead opening at all points of cut off, and will implicitly control the engine under the most abrupt changes in load, even to its full power.

The engines are run at a moderate speed, so as to obtain 500 to 600 feet piston speed per minute, their rated power being developed with thirty-five pounds average pressure through the stroke.

In Fig. 1, showing the automatic governor, *T, T*, is the case rigidly attached to the shaft of the engine, made in halves, bolted together for convenience in putting on, and revolving in the direction of arrows. *A* is the eccentric, having the proper degree of eccentricity and advance to give a ¾ cut-off when the parts of governor are at rest, as shown in cut, cast with an oblong hub, slotted to allow motion across the shaft, and also in halves for convenience in putting on. Cast as part of the hub are double lugs *B*, receiving between their ears the ends of the suspension arms, *C*, which are pivoted upon generous steel pins, *D*, solidly fixed in case, *T, T*.

G, G', are short connecting rods, pivoted at one end upon suspension arms at *E, F*, and at the other upon the centrifugal weights, *H*, at *K*.

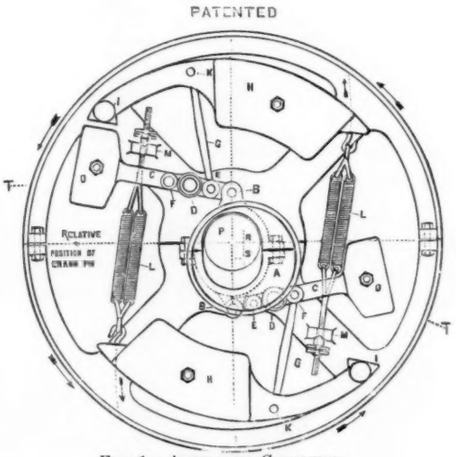
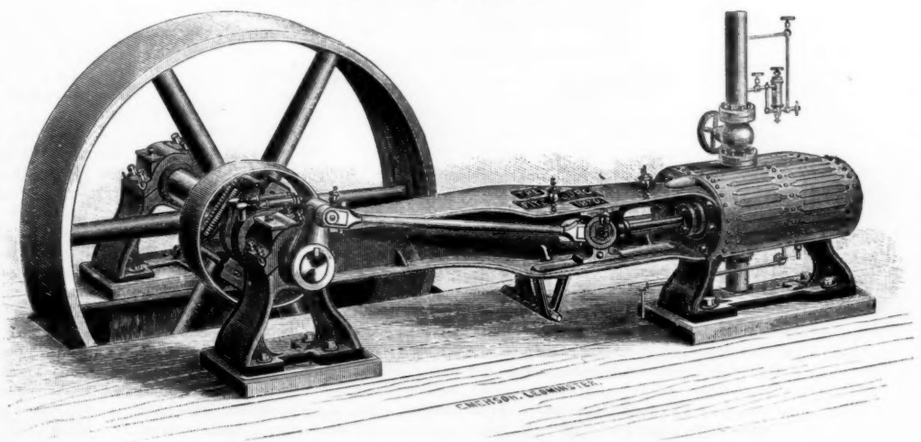


FIG. 1.—AUTOMATIC GOVERNOR.



THE FITCHBURG AUTOMATIC VARIABLE CUT-OFF STEAM ENGINE.

These centrifugal weights are each pivoted at one end upon large steel pins, *I*, and at their opposite ends have hooks, to which are attached one end of the springs, *L*, the other ends of the springs being attached to threaded hooks passing through lugs cast upon the case, and of course fixed. Upon the ends of these threaded hooks are knife-edge collars, and thumb nuts allowing for any needed adjustment of the tension of the springs. Brass bushings are forced into the arms, where they turn upon the steel pins, to prevent possibility of rusting and sticking.

The weights, *O*, acting over the steel pins, *D*, as fulcra, are to exactly balance the weight of the eccentric and its strap, and in vertical engines the valve and valve rods also, leaving no work upon the governor but to shift the eccentric when the load upon engine changes. The connecting rod, *G*, is attached to the suspension arm *C*, at *E*, acting directly upon eccentric, while the opposite rod, *G*, is attached to the opposite arm, *C*, at *F*, acting over pin *D* as a fulcrum in moving eccentric so that the outward motion of both of the centrifugal weights, *H*, is exerted with equal power in moving the eccentric in one direction across the shaft.

By simply transferring the ends of connecting rods, *G, G'*, from *E* to *F*, and from *F* to *E*, respectively, the outward motion of the weights, *H*, throws the eccentric in the opposite direction, and they are right for running the engine the other way.

The action is as follows: So long as the engine is below speed the eccentric is kept in its longest throw by the tension of the springs, and steam follows ¾ of stroke, but as soon as proper speed is reached the centrifugal action of the weights, *H*, overcomes the tension of the springs, and they move outward in direction of arrows, at same time lengthening the springs; by means of the connecting rods, *A, A'*, the outward motion of the weights turns the suspension arms, *C, C*, upon their fulcra, *D*, and through the ears, *B*, the eccentric is carried across the shaft from *S* toward *R*, and as the arcs described by the centers, *B, B*, are in opposite curves they compensate each other, and the center *S* of eccentric follows a straight line in its movement.

This manifestly decreases the eccentricity and increases the advance of the eccentric, giving an earlier cut-off to the valve until when the eccentric is swung squarely back of the crank the valve does not open at all, there being all points between this and extreme cut-off for variation. Upon the least diminution of speed the springs have more power than the centrifugal force of the weights, and the motion of the parts is arrested and turned in the opposite direction, giving a later cut-off as more work is performed by engine. As the valves are in perfect balance a long travel can be given them with no ill effect hence the cut-off is sharp even at the earliest point, assisted materially also by our Wrist-plate motion, and as the eccentric has to be moved but a very short distance an unusual closeness of regulation is obtained, the variation from perfect isochronism being controlled by the amount of weight and the tension given to the springs.

They are not limited as to speed as they can run anywhere from 60 to 350 revolutions. The governor can be used with a single valve, changing the point of compression at the same time that it changes the point of cut-off, or can be used to actuate an admission valve only, the exhaust valve being driven from a second eccentric and remaining constant as to all its duties.

The governor being a part of the shaft and engine, it is impossible for the engine to run away or for the governor to become detached.

The company use the same governor upon their automatic vertical engines, which they build to 100 H. P., the horizontals ranging from 30 H. P. to 250 H. P. single, or 500 H. P. in pairs. They are always ready to give any information needed in their line, and to guarantee satisfaction to those using their engines. We refer our readers to them confidently as they have many engines from 15 to 150 H. P. in size running electric machines.

The Italian Government have decided to award a premium of 10,000fr. (£400) to any one who shall perfect the most practical and useful system for generating and transmitting electrical energy. This premium is offered in connection with the Turin Exhibition.

The Gramme Machine Patent.

The London *Electrical Review* says that, perhaps, the most interesting event of the early part of the New Year will be that relating to the extension or lapse of the patent for the Gramme dynamo-electric machine in England. We have already notified that the British Electric Light Company has petitioned for a prolongation of this patent, which was granted to MM. Gramme and D'Ivernois, and which bears the date of the 9th of June, 1870, and is numbered 1,668. The company intend to apply by counsel to the Judicial Committee of the Privy Council, on the 1st of March, at the next sitting of the said Judicial Committee after that date, for a time to be fixed for hearing the matter of the said petition; so on or before the said 1st of March, 1884, notice must be given of any opposition intended to be made to the said petition, and any person intending to oppose the said application must lodge a caveat to that effect at the Council Office on or before that date.

The immediate development of electric lighting will depend, to a great extent, upon the result of this case, which will be awaited with a far greater amount of anxiety than was attached to the recent lawsuits respecting the Edison and Bell telephone patents.

The Gramme machine has, without doubt, gained the leading position amongst dynamos, and stands far ahead of all competitors, with the one exception, perhaps, of the Siemens' pattern. Without allowing ourselves to enter into the question of Gramme's indebtedness to the Paccinotti apparatus, it is not too much to say that to the former must be given at least the credit of making the cheap production of electricity, by means of dynamos, a *fait accompli*.

It is no less true that the majority of dynamo-electric machines of the present day, and they are ever on the increase, are more or less Gramme machines. Most of the inventors, or more properly speaking the improvers, of dynamos, have taken the Gramme apparatus as it stands on which to work their changes or modifications.

It is of course well known that many electricians have but little faith in the validity of the Gramme patent, and this belief has, without doubt, been strengthened by the fact that numberless *new* machines, so much like that of Gramme, that one might well ask "which is which," have been placed in the market with impunity. It is not a little to be wondered at that so much money has been spent in *protecting* these so-called inventions by letters patent, for if the Gramme patent be held valid, and an extension of time be granted, these numerous imitations will be useless, unless worked under a royalty. On the other hand, if the Gramme falls through, the thousand and one modifications of Gramme's machine will be, if we may use the term, worse than useless, because everybody will be at liberty to manufacture the original article.

As far as the application of Gramme's admirable machine to industrial purposes in England is concerned, we cannot call to mind any other instance of a scientific and useful invention so completely mismanaged. From the time it was brought to England by the late Richard Werdermann, it has apparently been most unfortunately placed; and it is only within the last three or four years that any activity, and this is not saying much, has been shown in furthering its introduction. The machine has been wonderfully improved of late—how much so can only be properly appreciated by those who remember the first apparatus manufactured in this country—and it is certainly one of the most valuable inventions of the present age.

We cannot attempt to foretell what will be the issue of the British Electric Light Company's application; but we call to mind that the evidence of one, the late Mr. Werdermann, which would have been perhaps the most important of all to one party, is lost to us. Another point to be remembered is that the Gramme patent, as fully explained in a recent number of the *Review*, is void in the United States of America on a point of law. This, however, may not affect the decision in this country, as the two cases are entirely different. Whatever the result, we trust that those appointed to decide the question will not fail to make themselves acquainted with the transactions of the telephone trials, so that justice may be so completely accomplished that the defeated will not have any good cause left for appeal.

On the Electrical Figures of Condensers.

By E. Villari.

If the free margins of a positively charged Leyden jar or of a plate of glass provided with circular coatings on both sides are powdered with a mixture of red lead and sulphur, there appears on the negative coating in connection with the ground, first a zone slightly covered with red lead, then a zone of about one centimetre in breadth, free from dust, and, lastly, a third zone covered with sulphur, sharply marked off inwardly, but gradually fading away on the outside. If a jar is charged negatively, the external zone is red, and from the coating there runs yellow ramifications through the neutral zone.

The zones which show discharges homologous to the adjacent coatings, are produced by the electricity which has been transferred from them to the glass. The zones on the surface of a condenser which show discharges opposite in character to the adjacent coating are produced by the discharge of the opposite surface. In fact, these latter zones are almost exclusively formed around the coating in connection with the ground in consequence of the excess of charge of the opposite coating. If the surface of a plate of ebonite is struck with a cat-skin and the powder is blown away, there appears at the part which has been struck a red spot without an opposite zone, and on the opposite or positive surface there is found a much larger red spot, due to the influence of the part which has been struck.

In order to obtain the zones homologous to the adjacent coating, it is requisite to experiment quickly and in dry air upon the coatings which have been directly charged; otherwise the excess of the charge of this coating becomes dissipated and the efficacy of the opposite comes into play, the action of the former decreasing and the zone of the opposite charge appearing.

If a condenser or a Leyden jar is suddenly charged by connection with a charged battery, the glass sides of the former receive the spark discharges, and are charged with the electricity of the coatings. On dusting, there are then formed upon the glass figures, which, according to the kind of the charge, are radiating yellow with a red lamettar halo, or red and lamettar with a radiating yellow halo.

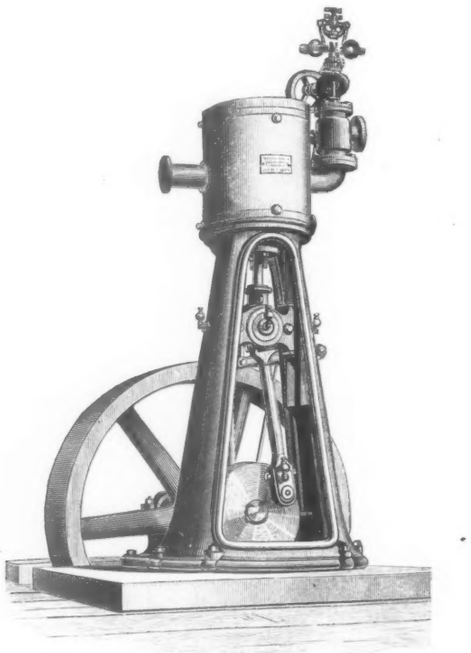
Similar figures appear if a jar is overcharged, when single partial discharges pass from the coatings to the glass sides; so that the charge of the charged coating decreases, that of the other coating being set partly at liberty and passing to the glass corresponding to the tracks of the partial discharge.

The figures on the side of the discharge are quite similar to those obtained by Antalik upon the surface of glass flasks.

The author then describes at length the phenomena observed on dusting a Franklin plate with small circular coatings.

He treats likewise of the figures which are formed upon the glass sides of a charged Leyden jar if dusted after discharge.

The figures can in general be deduced from the principle that when a coating loses electricity, electricity passes over to it from the adjacent glass, thus forming currents. On charging there occurs an opposite movement of electricity from the coating to the glass, and lastly, the charges upon both sides of the glass act upon the mixture of powders. The streams indicated were observed with the galvanometer.



Fitchburg Independent Engine, with Upright Shaft.

If a glass plate coated below is dusted above with the mixture of red lead and sulphur, if the coating is connected with the external coating of a charged battery and the internal coating is discharged by a discharger upon the middle of the upper surface, there are formed upon it luminous rays which leave furrows in the powder and produce radiating figures. The positive figures have branches fewer in number but finely ramified. The negative figures have more gently curved arms with leaf-like terminations. All these differences vanish if a sufficiently dense powder is used.—*Wiedeman's Beiblatter.*

Shall Selma Move Forward with Sister Cities?

A Selma correspondent says that Prof. R. S. Dobbie, representing the United States Electric Light Company, came there recently from Rome to examine into the feasibility of working up a local lighting company. He has just finished putting in an electric plant for the Rome Cotton Factory, and also one for street lighting purposes in the city.

Mobile and Montgomery have for some time enjoyed the superior facilities afforded by this great invention. Rome's arrangements to the same end are almost completed. Every town in the land that wants good lights at low prices, that wants to push itself forward, has already taken this step. Is it not Selma's opportunity and duty to join ranks with her wide awake, enterprising sisters? Surely there can be no question of it. Our leading citizens who are interested in the place's prosperity and advance should talk with Prof. Dobbie, who is an electric expert, and be convinced by knowledge of the facts and figures. Every one who visited the Louisville Exposition, or has been lately in any great city, knows that the electric light is a practical success, that it is rapidly superseding gas, for street illumination especially. The arc-lights on high poles in New York illuminate the streets for blocks, as if the moon was shining. Every nook and corner is permeated. The incandescent light, too, for house uses is still more perfect. Every one who watched it in the Louisville Exposition buildings at night was charmed with it. It is absolutely perfect in its steadiness, and strong, pure and soft beyond description—incomparably the best light the world has yet seen. We have recently observed it with the same characteristics on the New York and Jersey City ferry boats, and in several great daily newspaper type-setting rooms. We know of no better test of a light's steadiness and strength than its satisfactory use by type-setters, for their work is with minute black objects, requiring perfect accuracy of adjustment. All the talk about the light's impracticable imperfection is twaddle. In some places it may work unsatisfactorily, but the shortcoming is because of the use of unsuitable engines and machinery. The light will doubtless be further improved, but its present comparatively perfected state makes it far superior to gas.

Again, it is far more economical. To illustrate: The gas bill formerly paid by the Central City Oil Mills was about $60 per month. Now it has *ten-fold better* lights from a plant that cost only $900, and the monthly expense, including interest and wear and tear, is not over $20 per month. Rome Ga., is having put in a plant for thirty or more arc lights that will cost about $16,000. Each will displace its own cost in gas, and give far better light. Selma now uses 102 gas lamps, which, with expense of lighting, cost $2.75 each per month, or an aggregate of $2.80 per month. Our whole people know how inadequate these lights are. It is needless to expand on that subject. Now the question is, cannot a local company be organized that can very profitably furnish infinitely superior illumination for almost the same cost, and supply, besides, private consumers with the beautiful incandescent burners?

A talk with Prof. Dobbie leads us to believe that a company with a stock of $15,000 can easily accomplish this, furnishing thirty arc lights and five hundred incandescent lights. He is going to call upon our business men and lay the matter before them. Shall it not be put through? Every one knows the unsatisfactory gas supply. There is no need of enlarging upon that threadbare theme here. The most caustic criticism we know of is the fact that Col. J. M. Dedman, of the St James Hotel, who is the second largest consumer, has just received gasoline machinery, which he will use for lighting the St. James as soon as he can put it up. We heard yesterday of three firms on Broad street who were likely to follow his example. Let these gentlemen go into the electric light company instead. It is the only way to improve our illumination.

Syndical Chambers of Electrical Workmen.

A society with the above title has been formed in Paris to promote the technical training of men employed in electric work of different kinds by collecting for them in some central building useful drawings, models, specimens, &c., obtaining information and instruction for its members, and enabling them to meet and exchange observations and experiences. Appeals are made for the co-operation of industrial and scientific men of influence.

Braiding Machinery for Covering Electric Wire.

THE RHODE ISLAND BRAIDING MACHINE COMPANY'S NEW MACHINES FOR COVERING AND WINDING.

One of the important industries which has kept pace with the demand for insulated electric wires is the manufacture of braiding machinery, and inventive genius has reaped its reward in this as in all other fields. Since the introduction of the electric light, using strong currents of electricity, the demand for better insulating appliances has been great, and we are glad to note that the devices adopted to meet this have been very satisfactory.

We illustrate to-day two styles of machines manufactured by the Rhode Island Braiding Company, of Providence, R. I. This company has for many years been engaged in the manufacture of braiding machines of all varieties and sizes, some of which play an important part in the manufacture of insulated electric wire. Electric wire is insulated by means of a fibrous covering, saturated with some non-conducting chemical compound. This fibrous covering is usually laid upon the wire by a process of braiding or winding, or both combined. The machines of this company are designed for both processes. The accompanying Fig. 1 represents a double braider, which covers the wires with two thicknesses of braid, one upon the other. Fig 2 represents a double-winding machine, by which the wire gets two covers wound in opposite directions. Another variety of machine also gives the wire two covers—the inner being wound, the other braided. These machines vary in weight and capacity according to the nature of the stock designed to be worked, adapted to the requirements of manufacturers, and are to be found in the chief manufactories of electric insulated wire in the country, among which are:

The American Electrical Works, Providence, R. I.

The Ansonia Brass and Copper Company, Ansonia, Conn.

The Benedict & Burnham Manufacturing Company, Waterbury, Conn.

The Clark Ins. Electric Wire Company, Philadelphia.

The Electrical Supply Company, Ansonia, Conn.

The B. S. Hale & Son, Malden, Mass.

The Smith & Gelpcke Ins. Wire Company, College Point, L. I.

The Rhode Island Braiding Machine Company were the first in the field in the manufacture of wire covering machines, and it is their endeavor to keep abreast with the new developments in the art by designing new patterns as the business requires.

All supplies incident to the business of braiding and winding are always to be found here.

Messrs. Hood, Winchester, and Edmands, the energetic officers of this company, never lose an opportunity to make it pleasant for their patrons and callers; and a visit to their works, 89 Aborn Street, some eight minutes' walk from the Union Railroad Station, would afford the visitor the opportunity of seeing braiding machinery on exhibition, some varieties being always in operation there.

On a New Theorem in Dynamic Electricity.

Given any system whatever of connected linear conductors containing any electric forces whatever, E_1, E_2 . . . E_n, distributed in any manner whatever, we consider two points, A and A', belonging to the system, and possessing for the present the potentials, V and V'. If we connect the points, A and A', of a wire, A, B, A', of the resistance, r, not containing any electromotive force, the potentials of the points, A and A', assumes values different from V and V', but the current, i, which circulates in the wire, is given by the formula

$$i = \frac{V - V'}{r + R}$$

in which R represents the resistance of the original system, measured between the points, A and A', considered as electrodes.

Thus, Ohm's formula is applicable, not merely to simple electromotive circuits presenting well-defined poles, like a battery or a constant-current machine, but to any network whatever of conductors, which may hence be considered as an electro-motor with arbitrary poles, the electromotive force of which is, in each case, equal to the difference of the potentials pre-existing at the two points chosen for poles.

This rule, which hitherto does not seem to have been pointed out, is very useful in certain theoretical calculations. Practically, it enables us to ascertain immediately, by means of two data easily obtained by experiment, the intensity of the current which will traverse a branch to be joined on to any network of conductors, without it being necessary to enter otherwise into the constitution of this net.

To demonstrate the theorem, let us suppose that we introduce into the conductor, A, B, A', an electromotive force, $-E$, equal and opposite to the difference of potential, $V - V'$. It is clear that no current will traverse the conductor, A, B, A'. Thus the system of electromotive forces, $-E$, E_1, E_2 . . . E_n gives rise to a distribution of currents among which that traversing the conductor, A, B, A', is null.

Suppose, now, we introduce into this same conductor, conjointly with the former, a second electromotive force, $+E$, equal to the difference of potential, $V - V'$, and in the same direction. In virtue of the principle of the independence of simultaneous electromotive forces, the force, $+E$, gives rise to a new distribution of currents, which is simply superposed upon the former. Among these new currents that which traverses the conductor, A, B, A', is precisely the sought-for current, i, since the effects of the forces, $+E$ and $-E$, equal and opposite, annul each other. The current, i, being due to the single force, $+E = V - V'$, the seat of which is in the branch, r, we may, calling R a certain resistance, write, according to Ohm's formula,

$$i = \frac{V - V'}{r + R}$$

Moreover, the signification of the quantity, R, appears immediately; it is the resistance of a wire which may replace, between the points A and A', the original network of conductors without the peculiar yield of a constant source of electricity existing in the branch, r, being modified. The quantity, R, has then a precise physical meaning, and we may call it the resistance of the original net measured between the points, A and A', considered as electrodes. The announcement of the theorem results directly from this definition.—*Comptes Rendus.*

Luminous Jewels.

M. Gaston Trouve, the well-known electrician of Paris, has lately designed a series of ornaments for ladies' wear, consisting of glass, colored and cut to imitate rubies, diamonds, &c., fitted in an envelope, surrounding a small incandescent lamp of low resistance. The light shines through the pieces of glass only, and gives them all the appearance of the stone they are intended to imitate. The lamp is fed from a small battery which is carried about the person. It is composed of three pairs of zinc carbon plates (two carbons to each zinc) or a larger number according to the current required. These plates dip in a saturated solution of bichromate of potash, which is contained in an ebonite cell with three compartments. The plates are fitted into a cover, which is kept securely down on the top of the cell by two bands of india-rubber passed around the whole. Finally, the battery is incased in two sheets of gutta-percha, so as to prevent any leakage. A miniature switch is carried in the pocket or elsewhere, within reach, to which the battery and lamp wires are connected. The pressure of a finger on the arm of this switch makes or breaks communication with the lamp. The battery weighs (with six plates) 300 grammes, and will work about thirty minutes with a lamp of from 2 to 3 volts. A larger battery, to work a 4 or 8 volt lamp, weighs 800 grammes.

RHODE ISLAND BRAIDING MACHINE CO.'S DOUBLE BRAIDER.—FIG. 1.

BRAIDERS AND WINDERS. DOUBLE WINDER.—FIG. 2.

The Calibration of Galvanometers.

"The calibration of galvanometers," says M. E. Ducretet in *Comptes Rendus*, "ought to be verified frequently, on account of the variations of the magnetic field, due principally to the variations of the directing magnet of the galvanometer. The magnetic intensity of this directing magnet should be sufficiently great to render external variations of little account; they must, nevertheless, be taken into account, as they destroy the value of the calibration and lead to serious errors. It is, therefore, necessary to test it frequently. In order to facilitate this calibration and its verification, I transform the directing magnet into a kind of electro-magnet, encircling it with coils of wire of a certain resistance. In order to magnetize this bar of steel, we send through the coils, during a given time, the current of several 'Daniells' of large surface. The resistance of the coils being high, the battery is not polarized. Every time we wish to verify the calibration, we bring the magnetized bar to its original strength, sending into it the same current during the same time. It was in this manner that I arranged the directing magnet of my dead-beat universal galvanometer. This method can be applied to all galvanometers furnished with a directing magnet. A bar of soft iron furnished with similar coils might be substituted for the bar of steel; the current being kept on during the testing, and broken at the conclusion of the observation."

Economy in Incandescence Electric Lamps.

The *Electrical Review*, of London, says that "if the results of certain tests, made by Herr Goetz with the Cruto lamp, are to be relied upon, we may look hopefully forward to a greatly extended employment of incandescence electric lamps in the place of gas.

"Herr Goetz has contributed to the *Centralblatt fur Electrotechnie* a series of experiments which show some striking peculiarities possessed by the above-mentioned lamp. The Cruto carbon filament is deposited upon a very slender core of platinum. It was originally stated in descriptions of this lamp that the core of platinum was afterwards melted and dissipated by the application of a sufficient strength of current, and that there then remained in the completed lamp only a very fine hollow cylinder of pure carbon. It appears, however, which indeed always seemed likely to be the case, that the platinum core is not dissipated, and that the light-giving material is therefore a compound filament of carbon and platinum. A curious feature which had been noticed in connection with this lamp was its *increase* of resistance with increase of electromotive force. The particular lamps examined by Herr Goetz did not, however, show this to be invariably the case, as some of the filaments appeared to partake of the character of platinum alone, and to increase its resistance with increase of temperature, whilst others more resembled carbon, and decreased in resistance upon increment of temperature.

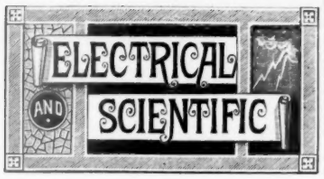
"Herr Goetz does not appear to have gone beyond a luminosity of 17 candle-power in his experiments, but it is at comparatively low candle-power that economy is now desirable. The two leading systems of electric lighting by incandescence in this country are principally laid out for 16 or 20 candle-power lamps. It would not be safe to say that *less* than 60 volt-ampères would be expended in producing the respective candle-powers given above, of either system. Yet, if the figures given by Herr Goetz are correct, the Cruto lamp gives a candle-power of 17 stearine candles for an expenditure of 32 volt-ampères, or 15¾ candle-power for 30.6 volt-ampères.

"Considering, however, that the experiments on the Cruto lamps appear to have been limited to four specimens only, we do not suppose that the results of Herr Goetz will go for much in this country. Still they show, even pre-suming them to be picked samples of Cruto's system, a higher degree of economy than we can recall with any other type of lamp. Such a result, however, is only calculated to induce our English manufacturers to extra exertions towards a greater economy in incandescence electric lighting, and the researches of Herr Goetz will, therefore, not have been useless. The author of the experiments made some tests, terminated before completion however, by an accident, to determine if the change in resistance made any difference in the relations between light and power, and he concludes that it has no influence. The experiments, however, are within such narrow limits that we should not be inclined to put much faith in them. It is somewhat difficult to believe in the economy of a lamp, the resistance of which increases with additional electromotive force, and the excellent results obtained by Herr Goetz are probably due rather to the superior quality of the carbon used, which is deposited and not prepared by carbonizing a vegetable substance, than to any merit possessed by the peculiar combination.

"Indeed, if the platinum core *could* be dissipated or destroyed, leaving the light-giving material purely carbon, we should expect even better results than those quoted, provided the hollow cylinder would stand without its metal support. We have no information as to the lasting capacity of the Cruto lamps, but we need scarcely say that a long life is most essential to its success."

Schlaefli's Electric Clock.

An electric clock has been patented by Mr. Jean Paul Arnold Schlaefli, of Soleure, Switzerland. The invention relates to an improved secondary electric clock, to be actuated by a weight raised periodically by a current at frequent intervals from a central station. The clock has no pendulum or balance wheel to regulate its rate of going, but is dependent solely upon the current transmitted, the minute hand being moved at minute intervals over minute spaces.



Preparations are being made to light Westminster Abbey by electricity.

Electricity in Franklin's time was a wonder; now we make light of it.

An electric light company, and also a district telegraph company, has been formed in Trenton, New Jersey.

The Tucson Electric Light Company, of Tucson, Arizona, have started their new lighting station. Their plant consists of a 40 and a 16-light Brush machine.

During the night of November 17, the snow in the valley of Storelvdal, in central Norway (between 61° and 62° north latitude), was covered with a layer of black and gray dust of probable volcanic origin.

The Edison Company for isolated lighting have declared a dividend of four per cent. on its paid up capital. This dividend will be paid at the office of the company, 65 Fifth Ave., on or after Jan. 28th.

Mr. R. G. Brown, formerly of the Société Générale des Téléphones, of Paris, France, is now in New York, and will remain in this country for the purpose of introducing the Gualord & Gibbs system of electrical distribution.

The Star City Electric Light Company, of Lafayette, with a capital stock of $25,000, has been incorporated. It proposes to maintain and operate the Van Depoele system of electric lighting. N. T. Gassett, E. J. Coltman, R. J. Randolph, F. B. Caldwell, and J. A. P. Vanclorm are the directors.

Mrs. Cornwallis West, who is coming to this country soon, is a lady and a scholar. She took occasion to say, some time ago, that American paragraphers are the "bright electric lights of the New World." Of course after this nothing will be said to shock her.

The new Standard Theater, Chicago, has just been fitted up with electric gas-lighting apparatus, and the managers are thinking of introducing the electro-mercurial fire-alarm soon. This automatic alarm, by the way, is in very extensive use in Chicago, several miles of street front being protected from fire by it.

A notification has been issued by the Penn Electrical Company, No. 1,102 Walnut street, Philadelphia, to the effect that they have disposed of their good will and the exclusive right to manufacture and sell their patent electric gas-lighting apparatus to the Novelty Electric Company, Fifth and Locust streets, Philadelphia, and have retired from business, closing their offices.

As an evidence of the appreciation of the business capacity and energy of Mr. Edward H. Goff, President and General Manager of the American Electric and Illuminating Company, by those who know him best, it is stated that he has recently been offered the presidency of a prominent railroad at a $10,000 salary. Having previously had much experience in railway management, such a position would have been in many respects agreeable to him, but his interests are so thoroughly identified with the company which he has so successfully built up, he has felt obliged to decline it.—*Boston Post.*

An Electrical Speed Indicator.

The importance of keeping up a regular speed in electric light and machinery, says *Engineering*, has led Mr. W. Groves to design an electrical indicator of the number of turns which may be placed at any distance from the engines and dynamos. The apparatus is based on the well-known Wheatstone counter, but all the figures are on one dial. The time is limited to half a minute by a clockwork movement. The apparatus works in any position, and is therefore suitable for ship lighting. It requires occasional winding up, once for every 6,000 observations.

The United States Electric Light Company have declared a dividend of 5 %, payable to their stockholders of record Feb. 1st. The transfer books will be closed on Saturday and remain so until Feb. 2d. The opening weeks of 1884 show a favorable outlook for business prosperity in general, and especially for the electric lights. That more money can be made from a good system of electric lighting to-day, than ever before, is apparent to every one who has examined into the subject, and it would not be too much to say that it is our belief that this company will exceed the earning of any previous year during its existence.

A Steam Magnet.

C. Thouvenot, as did previously Tommasi, obtains an electro-magnet by passing steam of the pressure of two atmospheres through a copper tube of 1.5 millimetre in diameter coiled round an iron core.—*Wiedemann's Beiblätter.*

A Micro-Thermometer.

Under this title M. F. Larroque described, at a recent meeting of the French Academy of Sciences, a very delicate thermometer he has constructed for measuring small variations of temperature. It will, the author says, measure a variation of one-thousandth of a degree.

A Compliment to the Brush Electric Company.

The emperor of Brazil has presented to this company a large artificial flowering plant, made entirely of the feathers of South American birds, as a token of his gratification at the completing of a very successful system of electric lighting in the city of Campos, Brazil.

Electrical Engineering at the Washington University.

By invitation of about twenty engineers of St. Louis, Prof. Nipher will organize a class in electricity and magnetism. The class will meet on Saturday evening, January 12, at 8 o'clock, in the lecture room at Washington University. The work will be adapted to the needs of engineers who desire to become familiar with the subject, and will involve the general methods of electrical measurements.

Boston and suburbs show a great increase in use of the electric light. It will be seen by the following statement that there were on January 1st, 1884, more than three times the number of arc lights in use than on the 1st of January, 1883. According to the last report of the department there were 116 electric lights in the streets and squares of the city, January 1, 1873. The number in use at the present time is 381, located as follows:

City proper	278
Roxbury	34
South Boston	65
Charlestown	21
Dorchester	3
Total	381

The Correction of Galvanometers.

Engineering says that "it happens that the value of a division of the galvanometer scale is sometimes altered by a charge of magnetism in the directing magnet. To correct this error, M. Ducretet now winds that magnet with a coil of wire, thus transforming it into an electro-magnet which he magnetizes by an electric current at will, in order to bring it to its proper standard strength. This device has been applied by him to his well-known universal galvanometer, but it is applicable to all galvanometers having directing magnets. A simple electro-magnet having a soft iron core magnetized during observations by the current of a standard Daniell cell is also substituted by him for the directing magnet."

A dispatch from New Orleans, La., says: The Board of Managers of the World's Industrial and Cotton Centennial Exposition adopted the design proposed by G. M. Jargenson, architect, of Meriden, Miss., for the main building, which will be 1,500 feet long and 900 feet wide, with 1,000,398 square feet of floor space, including a music hall in the center with a seating capacity for 12,000 persons. The design also provides for main offices, telegraph office, newspaper department, police, hospital and waiting rooms and life-saving apparatus. Ten plans were opened and three premiums awarded. The building will be the largest exposition building ever erected, except the one in London in 1862.

Electric Brake.

The Waldumer electric brake is, we are informed, likely to be introduced at an early day on one of the prominent trunk lines of this country, and is being investigated with favorable intentions by one or more prominent foreign railways. Mr. L. W. Goss, who is prominently connected with the enterprise, is a leading attorney of Cincinnati, and expresses great satisfaction with the mechanical operation of the brake as far as it has been tested.

A company has been formed in London for the construction and working of an electric railway under the River Thames, through iron caissons. It will be worked by means of a stationary engine, transmitting the power to the carriages, which will run separately, start as soon as filled, and occupy about three and a half minutes in the journey.

A London International Exhibition for 1884.

The Crystal Palace Company, of London, advertise the holding for six months, from April 3 next, of an "exhibition of arts, manufactures, and scientific, agricultural, and industrial products," and invite the participation of American exhibitors. The enterprise is in no way a Government affair, but it is suggested that it will afford a valuable opportunity for American manufacturers, &c., to bring their productions before a wider circle of possible customers in the largest and wealthiest city in the world. A court in a central position on the main floor has been set aside for expected American contributions, and the ordinary charge for space is two shillings per square foot, with some exceptions both higher and lower.

A Simple Method of Examining the Thermo-Actino and Piezo-Electricity of Crystals.

By A. Kundt.

The author has discovered a method which, in point of simplicity and convenience, leaves nothing to be desired. At the moment when the electric distribution effected in a crystal by change of temperature, or by pressure, has to be determined, it is dusted over with a mixture of sulphur and red lead, which is sifted through a cotton sieve with fine meshes. In this process the sulphur becomes electro-negative and the red lead positive, and, as in Lichtenberg's figures, the negative sulphur deposits itself on those parts of the surface of the crystal which are positive, whilst the real lead attaches itself to the negative portions. The arrangement of the two powders gives a distinct representation of the electrical arrangement on the surface. Sulphur cannot be used at temperatures exceeding 117 degrees C.; in its place very finely divided silicic acid must be taken. The operation of dusting the crystals should be performed under a hood with a strong lateral draught.—*Wiedemann's Annalen.*

On the Retardation of the Demagnetization of Iron by the Induction Currents Produced in its Interior.

By E. Stracciati.

According to the method already employed by Felici, the author obtains the following results for iron rods of 252—485 *mm.* long, and 13—32 *mm.* thick, iron wires of 100—300 *mm.* long, and 1—1.5 *mm.* thick, and slender iron rods of 4.5—8 *mm.* in thickness, steel blocks and steel tubes; if the iron mass is demagnetized in presence of two open coils, a magnetizing and an inducing, the deviations of a galvanometer connected with the latter spiral ensue a certain time, *t*, after the opening of the magnetizing currrent, according to the formula $F = A\ e^{-at}$, if the iron has no coercive power. If it is not absolutely soft, then, as in the case of steel, the formula is—

$$F = A\ e^{-at} + B\ e^{-\beta t}.$$

The first formula is the more correct in proportion as the magnetizing power is feebler. With the increase of the magnetism the rapidity of its disappearance diminishes at first very rapidly, and then by degrees more slowly. If induction currents are formed in the iron mass the disappearance of the magnetism is greatly retarded.—*Wiedemann's Beiblätter.*

The Thomson-Houston Electric Company, whose principal office is in Boston, have lately opened an office in the Montauk Block, Chicago, and intend hereafter to make the last-named city their general headquarters for their large and growing Western business.

The company's lights made a very favorable impression at the National Exposition of Railway Appliances held not long since in Chicago, where they were in competition with most of the well-known lights.

The Thomson-Houston Company has lately put plants in Peru, Ill., Quincy, Ill., Des Moines, Ia., St. Joseph, Mo., Leavenworth, Kansas, Louisville, Ky., Ottawa, Ill., and quite a number of other Western cities.

At Quincy, Ill., before it was decided what light to use, a commission was appointed to investigate the matter. The committee was composed of the town council and twelve citizens.

The committee, after seeing the different lights in operation for a few days, concluded that the best general results were obtained from the Thomson-Houston, and so reported.

Another committee, of mechanical experts, was then appointed to report more particularly on the dynamo machines themselves, power required to run them, lamps, etc.

The report of this committee was also favorable to the Thomson-Houston apparatus.

In view of these two decisions in favor of the Thomson-Houston apparatus the light of that company was adopted by Quincy, and quite an extensive plant was purchased and put in operation.

At the recent Exposition in Cincinnati the Thompson-Houston apparatus was awarded the gold medal and a cash prize of six hundred dollars.

The Thomson-Houston people seem very confident that their apparatus will be as favorably received in the West as it has been in the East, where they claim to have replaced in many towns the plants of other companies with their own apparatus, after

having had an opportunity to show the superiority of the latter.

This company was formerly known as the American Electric Company, and bore this name when the tests above spoken of were made at Quincy.

The Ogden Electric Light Company have had considerable trouble with their water-wheel since starting their plant in Ogden City, Utah. As a result af their experience, they have concluded to take out the "Capron" wheel on accont of its unsatisfactory service, and replace it with one of Leffel's. It would have been wise to have made this or some other good selection in the first instance, rather than blindly go ahead spending money and wasting time over something that at best could not give more than ordinary service.

Gas vs. Electricity in Hartford.

The public sentiment in favor of the electric lights was again reflected in the Board of Councilmen last night. That Board again passed the resolution ordering lights of that character for the city hall square and neighboring localities, after voting down several amendments. In the Aldermen—where gas has a more energetic advocacy—this plan has been repeatedly rejected. But there is a gradual and steady increase of public sentiment favorable to the better light, and its adoption is only a question of time. But if we wait for that, we lose the advantage of this light in the years when Hartford might just as well enjoy it with other cities, even if it does cost a little more than gas.—*Hartford Times, Jan.* 15.

The International Electrical Exhibition.

The arrangements for the proposed International Electrical Exhibition, which is to be held in Philadelphia in September next, under the auspices of the Franklin Institute, are being carefully perfected. The Board of Managers of the Institute met on Wednesday evening last week, and approved the architect's plans for the building: These constitute a frame temporary structure, which will cover an area of 70,000 square feet. The building will have four unequal sides and be surmounted by a truss roof. The object of the latter is partly for ornamentation and light and partly to provide acoustic properties for a long music hall, which is to accommodate the musical festival to follow the exhibition. The estimate of the cost of the building is $40,000, which includes a permanent brick foundation, it being proposed at some future day to replace the temporary frame structure with an enduring one of iron. The site for the exhibition is on a plot at Thirty-second street and Lancaster avenue. In a few days the Secretary of the Franklin Institute will mail copies of the rules to govern the admission of exhibits, together with other information, printed in various foreign languages, to parties in Europe who have made inquiries for space. The work upon the building will begin on the 1st of March, and the exhibition will open on September 2.

On a Magnetic Induction Compass.

M. MASCART.

Weber's inductometer enables us to determine the magnetic inclination by the measurement of the currents induced in a conducting frame, which is made to revolve alternately 180°, first round an axis horizontal to the horizon, and then round an axis vertical to a plane perpendicular to the magnetic meridian. This is the method in use in many observatories.

If the apparatus is so arranged that the axis of rotation of the frame can take any direction whatever in the magnetic meridian, and if we seek by approximations two directions such as that for a rotation of 180°, the needle of the galvanometer undergoes equal deflections in opposite directions, and the line bisecting these two directions will give the position of equilibrium of an inclination needle. This second method has recently been proposed by M. Wild.

It is clear that the induced currents must be *nul* when the axis of rotation of the frame is exactly parallel to the direction of the magnetic force.

With the ordinary process of observation, which consists in turning the frame by 180°, we obtain thus the same exactitude as by measuring the angles of deflection. But the method of the *nul current* permits us to eliminate every measurement of deflection, as well as the regulation of the initial and final positions of the moveable frame. It offers especially the advantage that if we are already near the direction sought, we may by alternate movements of the frame, of the same period as that of the oscillations of the galvanometer needle, multiply the angles of deflection so as to render manifest the direction of a deviation, which would otherwise be inappreciable. The precision of the method is thus considerably increased; we may then greatly diminish the dimensions of the turning frame, and it is sufficient to employ a galvanometer of suitable resistance to which the maximum of sensibility has been given.

I have sought for several years to realize this experiment by means of an easily portable apparatus. It comprises an azimuth circle, upon which moves a support carrying a ring moveable round a horizontal axle. The angle which this ring makes with the horizon is measured by a vertical circle. The frame, only 0.12 meter in diameter, is carried by the ring, and can revolve on an axis perpendicular to that of the ring. The dimensions of the instrument are not greater than those of an inclination compass.

A series of methodical approximations enables us at first to render the axle of the ring perpendicular to the magnetic meridian. By a second series we bring the axis of rotation of the frame into the direction of the inclination needle. With the repetitions necessary for eliminating the errors of regulation, the entire observation lasts less than half an hour—scarcely the time necessary for determining the inclinations by means of the magnetic needle.—*Comptes Rendus.*

Barnett's Accumulators and System of Electrical Distribution.

We find in a recent number of the London *Electrical Review* the following description of this accumulator:

This is a system for the distribution of electricity for domestic purposes by means of secondary batteries placed in the houses or other buildings in which the electricity for light or power is required.

The batteries on each circuit are all coupled in series by a wire going from house to house from the lighting center where the machines are placed; and each set of batteries is provided with an automatic cut-out instrument by which they are switched into the charging circuit directly they are in the least discharged, and switched out again, when refilled, the break in the charging circuit being bridged over at the same time.

The advantages to the consumers are said to be:—

1st. That they are totally independent of the center in case of an accident to the machinery; therefore it would be absolutely impossible for the lights to be suddenly extinguished from the failure of an engine or boiler (which defect could be repaired or fresh machinery started before the batteries failed to supply the requisite current).

2nd. A perfectly steady and equal light with no fluctuation. The batteries may be compared to a cistern of water, and the automatic cut-off to the ball which regulates the supply as required.

The advantages to the supplying company are:—

1st. Only one-third of the usual power is needed at the center to light the requisite number of lamps, as the engines can be run during the day for charging the batteries.

2nd. In comparison with multiple arc distribution, the saving of money in cables is sufficient to pay the cost of accumulators.

3rd. No waste of coal in "getting up steam."

4th. Larger centers than are now contemplated to be used for lighting could be used, with the consequent economy of a large center over a number of small ones.

With regard to the battery, the loss of current in charging and discharging, as ascertained from careful tests taken at Paddington during ordinary work, is less than 10 per cent. This test was taken from the old experimental set which has been constantly at work for nearly 12 months, and not from a single new cell in a laboratory, but under such conditions as would be met with in ordinary work. The E. M. F. of the battery is 2¼ volts per cell; this E. M. F. remains constant for ⅞ths of the time of discharge, after which it drops to 2 during another ⅛th and then falls to zero.

The battery is practically dry, the only solution required being contained in the pores of the active matter and felt; this solution is used very acid, so that in the event of evaporation, when the air became moist again, the affinity of sulphuric acid for water would attract the requisite amount from the atmosphere, but practically it operates by not allowing evaporation to take place. These batteries are quite solid and will stand shaking and rough usage without any danger of spilling acid or short circuiting internally. The active matter cannot become separated from the conducting lead plate either mechanically or electrically, as during formation the divided lead swells with great force and is kept in the best possible contact with its conductor.

It is calculated from the inspection of conducting plates which have been in use a considerable time, that the plates will be good for 10 years, after which period they may be removed and fresh ones pressed in, when the battery will be good for another 10 years.

This battery is the smallest in size, in proportion to its power, which has yet been produced.

These important features specially fit it for railway work.

The batteries for railway train lighting are provided with foot-plates, so that simply placing the battery in its position in the train (as a foot-warmer might be), the connections are made and the lamps lighted. Each battery will maintain a 12 C. P. Swan lamp from 19 to 20 hours and measures 1 foot 10 inches × 7 inches × 7½ inches outside measurement.

These accumulators require full current for one week to form them.

They are stated to be simple in construction and cheap to manufacture.

We may add that Barnett's system, on which we have in our other columns made some comments, has been employed at Paddington during the last three months, and has been working most satisfactorily, there being three offices now illuminated through the agency of these accumulators.

The Gunpowder Cap.

The ignition by the spark of gunpowder inclosed in a cartridge was probably first accomplished by Benjamin Franklin in 1750, but not practically employed until Mr Moses Shaw, of New York, fired a blast in the year 1831, nearly a century later. Since then electrical exploding has become a special and intricate art. It has been found not only a convenience in the conduct of ordinary blasting operations, especially when nitroglycerine or similar detonating explosives are fired in damp situations, but by its adaptability to the simultaneous ignition of numerous separate fuzes, either distributed throughout one or in separate mines, it has rendered possible both industrial and military engineering operations on a scale of extraordinary magnitude which its development alone rendered feasible. Of these the first noted example was the cutting through for railroad purposes of the South Down Cliff, 400 feet high and 300 feet long, near Dover, England, by Mr. Cubitt, in 1843, when 400,000 cubic yards of chalk were detached at once by the simultaneous explosion of three separate charges of 18,000 pounds of powder each.

Since the removal of the wreck of the Royal George, by Sir Charles Pasley, in 1839, the first noted instance of the use of electrical ignition in subaqueous blasting, and the partial removal of the obstructions at Hell Gate, in 1851, by Mr. B. Maillefert, the spark has almost entirely superseded the expensive so-called "electric fuze," which necessity had so wonderfully perfected. But in submarine, as in overground engineering operations, either civil or military, by its applicability to simultaneous ignitions it has permitted the achievement of most remarkable operations. Of these, the successful blast at Hallett's Point, near Hell Gate, by General Newton, in 1876, when 3,640 charges of powder were simultaneously ignited, is the most notable example.

The literature of electrical exploding is somewhat restricted and difficult of access, since its development has been effected chiefly by secret experiments of leading governments; but it seems decided that the progress of the art has been wholly dependent upon—1, the insulation of the conducting wires; 2, the construction of the fuze; 3, its priming; and 4, the quality of spark employed. The first submarine cable being of cotton-covered copper wire, varnished with asphaltum and bees-wax, originated with Col. Colt earlier than 1842.

In 1848, Faraday first recommended guttapercha as an effective insulating material, and almost immediately, as a vulcanized preparation, it was applied by the Electric Telegraph Company, of London, to the covering of conducting wires, being found especially suitable; and long, almost exclusively, used for subaqueous conductors, though cotton-covered paraffined wires, resembling Colt's early cables, are now often used.

A device to prevent boiler explosions was recently patented by Page and Carley, two experienced engineers. It is called "The Electric Low Water Alarm for Steam Boilers." In construction it is simple. An electric battery is placed on the wall near the boiler, and next to it is a gong and connected to the battery by negative and positive wires. Those wires run to the water gauge and connect with a glass bulb filled with mercury. When the water falls below the point of attachment the steam rushes in the space surrounding the mercury bulb, and the mercury expands. It rises in the tube and comes in contact with a platinum wire, thus closing the electric circuit and ringing the alarm bell. When water is pumped into the boiler it forces the steam back and breaks the circuit and puts the alarm in working order again.

From the numerous researches made by Prof. Hughes, the well-known English electrician, he formulates the following interesting theory of magnetism, namely: That each molecule of iron, steel, or other magnetic metal, is a separate and independent magnet having its two poles and distribution of magnet polarity exactly the same as its total evident magnetism when noticed upon a steel bar magnet; that each molecule, or its polarity, can be rotated in either direction upon its axis by torsion, stress, or by physical forces such as magnetism or electricity; that the inherent polarity or magnetism of each molecule is a constant quantity like gravity—that it can neither be augmented nor destroyed. The conclusions thus propounded by Dr. Hughes are the result of prolonged and painstaking experiments.

Electric Conductivity of Sulphur.

A professor at one of the French *lycees* has discovered that though sulphur is an insulating material at its ordinary temperature, it becomes a conductor as soon as it is heated. Its conducting power increases with the temperature, and at the fusing point is very considerable. At 320° Fahr., at which point sulphur changes its physical condition and becomes pasty, the conducting power diminishes, but increases again when the substance has attained perfect fluidity. Similar facts have been noticed with regard to phosphorus.

Telephonic News

The Board of Directors of the Wisconsin Telephone Company have declared a dividend of two per cent. for the quarter ending December 31st, 1883.

The Western Electric Company have just finished a 50-double wire underground telephone cable for the Chesapeake & Potomac Company's use in Washington, D. C.

The regular annual meeting of the stockholders of the United Telephone Company will be held at the offices of the company at Kansas City, Mo., on Wednesday, January 25, 1884, at nine o'clock A. M., for the election of a board of nine directors, and the transaction of such other business as may properly come before the meeting.

The Telephone at Dover.

Telephonic communication is being laid between the turret on the Admiralty Pier, Dover, and the Western Heights and Castle, and other military positions on shore. The object of this is that in case of actual warfare the working of the guns may be directed from a more elevated position; also that easy communication may be secured.

The Telephone on French Railways.

The French railway companies in general have at last decided to adopt the telephone as a warning apparatus, instead of the telegraph. The Western Company made this change some time ago, but the other companies have only now determined to follow its example.

Mr. T. W. Milburn, division superintendent of the southwestern division of the Erie Telephone Company, has just returned from Brownsville, Texas. Mr. Milburn expressed himself very much pleased with the construction and management of the Brownsville exchange, characterizing it as the best built one in the State, not only as regards the lines proper, but also in the arrangement of the central office. He has satisfied himself of the advisability of lines to Rio Grande City, Point Isabel, &c., and they will probably soon be opened for business.

The Directors of the Erie Telegraph and Telephone Company met at 40 Pearl street, Boston, on the 14th. The Treasurer's report showed the net earnings of the Company for the quarter ending Dec. 31, December being estimated, to exceed $70,000. A dividend of 1 per cent. to stockholders of record Jan. 15 was declared, and the books will be closed from that date till the 26th. The dividend will be paid on the 25th. It amounts to $48,000, leaving a surplus of over $22,000, which, added to a previous surplus, makes a total of $52,000. The surplus will be used for construction purposes. The reduction of the dividend was deemed advisable in order to have a surplus to carry on the extensive growth of the company and pay a portion of its debts.

The Inter-Continental Telephone Co.

The Inter-Continental Telephone Company has just received advices per steamer Caracas from La Guayra, Venezuela, showing a rapid increase in their business in this Southern territory. The trunk line between Caracas and La Guayra was completed on the first day of January, as anticipated, and its first day's business was fifty-four telegrams, or rather "telephonagrams." La Guayra being the port of entry to Caracas, the capital of Venezuela, a very large business between the two cities is assured. The system already embraces 190 subscribers at Caracas and sixteen at La Guayra, paying a monthly revenue of $1,030, fifteen more subscribers await connection at La Guayra and thirty-five at Caracas, besides which applications for exchanges at Valencia, Porto Cabello and other points are under consideration.

The following places are now connected with Albany by telephone: Amsterdam, Athens, Ballston, Cohoes, Cambridge, Castleton, Catskill, Canajoharie, Central Bridge, Claverack, Eagle Bridge, Fort Plain, Fort Edward, Fonda, Green Island, Glens Falls, Gloversville, Ghent, Hudson, Johnstown, Kinderhook, Lansingburgh, Lake George, North Adams, Palatine Bridge, North Hoosick, Lebanon, Shakers, Mt. McGregor, Niverville, Pittsfield (Mass.), Palenville, Rutland (Vt.), Schenectady, Schuylerville, Saratoga, Sharon Springs, Stuyvesant Falls, Troy, Valatie, Waterford, West Troy, White Creek, White Sulphur Springs, Whitehall, Rondout, Kingston, Saugerties, New Paltz, Newburgh, Cornwall, Canterbury, Walden, Goshen, Middletown, Port Jervis, Honesdale (Pa.), Fishkill, Fishkill Village, Glenham, Matteawan, Cold Spring, Garrisons, Wappingers Falls, New Hamburgh, Hughsonville, and New Hackensack.

From this showing we conclude General Manager Uline is second to no one in the extension of extra territorial lines, and the large dividends which his company has paid speak volumes for his management of the exchange business.

A Telephone Wire Protector.

The Fire Commissioners of New York quite recently examined the working of a telegraphic and telephonic protector at the main station of the United States Electric Light Company, No. 36 Stanton street. The object of the protector is to save telephones from injury when an abnormal current of electricity is thrown over the wires, as by crossing with electric light wires whose currents are of high intensity. The instrument in question is of small size and looks much like a telegraphic instrument. It has a single coil magnet the size of a Morse relay magnet. When an excess of current over the normal amount occurs, connection is formed with a ground wire, which runs off the excess. At this exhibition of the working of instruments a sufficient currrent to burn out an ordinary telephone was turned through the protector, which performed its work satisfactorily, and the ground wire took off the excess of current, so that the operator at the telephone knew of a disturbance on his wire only by the click of a spring in the protector.

Fitch Maynard, proprietor of the Perry Hoxie & Co. machine shops in New London, Conn., has invented an automatic-acting insulator or wire holder for telegraph or telephone wires, which is said to be cheap and to possess many advantages over the old system of stringing or putting up the wires. The invention consists of two blocks of wood, hinged at one end and bound together by a wire latch at the other. In the middle of the blocks, facing each other and making a close joint when the apparatus is shut, are set in two cubes of glass, through which a groove is cut and through which groove the wire passes and is held firmly. One of the pieces of wood is larger than the other, and turned down to a round handle so that it may be set into a staple on the telegraph pole. The scheme does away with all wire twisting around the common glass insulators, as at present, and it can be operated as rapidly as the mechanical labor of shutting the wires into the machine will admit.

The following schedule of earnings by the Central American and Mexican Telephone Companies are reported to us for past year by reliable authority. Capital, par value, gross earnings, &c., of each: Tropical-American Telephone Company, Limited—Capital, $400,000; par, $10; earnings last 12 months, $17,000 net. Mexican Telephone Company—Capital, $1,250,000; par, $10; earnings last 12 months, $12,000 gross. Mexican Central Telephone and Telegraph Company—Capital, $450,000; par, $10; earnings last 12 months, $250 net for November, 1883. Inter-Continental Telephone Company—Capital, $200,000; par, $10; earnings last 12 months, $1,030 gross for December, 1883.

A careful comparison of the above figures, which are taken from printed statements made by the several companies, in connection with the consideration of the territory controlled by each, the rights and contracts held by each, and the earning capacity of each, will show that the greatest disparity exists in the quoted market price and real value of the shares of the different companies named. "Tropical" has earned a net 14 per cent. on $350,000, its issued capital; figuring the shares at $3 each, they are quoted at 1½ to 1¾ bid; $2 asked. "Mexican" has earned a bare 1 per cent. gross on its issued capital; its shares are offered at 2⅛, and 2½ to 2⅝ bid.

The Latest from Texas.

It appears that at Sherman a power generator is used for calling subscribers, and is located for convenience in a foundry, where the machinery is in motion ten hours per day.

One of the workmen, who had been down with the "chills" for some weeks, thinking he had recovered, reported for duty at the shop, and worked along as usual till about noon, when, being thirsty, he proceeded to the water barrel to take a drink.

Those who witnessed the performance, say that his eyes glared, his legs twisted themselves into a bow-knot, and that he acted in a manner indicative of a violent attack of the jim-jams.

However, he finally rolled away, picked himself up, and with trembling gait reported to the foreman that he had had a "fearful fit," and must see a doctor at once.

The last seen of him, he was wandering dejectedly up the street in search of a physician.

The fact that a wire from the power generator led to the chain which held the cup, and that a person by stepping on a damp place and drinking at the same time completed the circuit, is advanced as a satisfactory theory of the "fit." D.

The Newark, N. J., Telephone Exchange.

SOME POINTS IN WHICH THE MANAGERS OF THE NEWARK SYSTEM CLAIM TO BE AHEAD OF THE FIELD—HANDY BURGLAR ALARMS.

"Newark has the best telephone system I have ever examined," said a prominent electrician recently, and I have seen nearly every exchange of any consequence in America. That may appear to be a strong statement, but I have doubts if there is a city in this country with equally as good a service." At the central office, in a small second story room facing Market street, over the Western Union Telegraph office are a dozen boys all as busy as beavers, flying hither and thither, sticking little brass plugs with a rubber head in a hole here, pulling out one there, then rushing to another place and repeating the operation over and over again, in a checker board table about fifteen feet long and five and a half feet high, which stands upon its edge and contains a few thousand little holes into which the brass plugs fit nicely. At the other side of the room are two annunciator cases, operated by two boys who are kept busy answering calls from subscribers, '186 wants 243' one of them calls out in an ordinary tone of voice, '284 wants 210,' comes from the other boy, and so on. At a small table near the annunciators sits a boy pencil in hand, and as each call for connection is made he marks it down on a small strip of paper. Assistant Superintendent Marsh, whose eyes and ears seem to be everywhere, places the slip on one of the five small "trunk tables," at the same time telling the boys at the large table who handle the brass plugs what to do. There was no confusion, no trouble, each one knew what he had to do, and did it in a rapid, confident manner.

A SYSTEM OF THEIR OWN.

"We have a system of our own," said Superintendent Jabez Feary, "and are so well satisfied that it is unequaled by any other telephone exchange that we are willing and anxious to make the test at any time. We are always even up with the business and never get confused or mixed up. As soon as a subscriber wants another the little drop on the annunciator, which is connected to the end of the wire on his circuit, falls, revealing the name of the person calling. His number, you see, is just above the drop. The attendant sticks that brass plug in the hole under the drop and gives it a turn at the same time asking what number is wanted. He tells the boy who is at the desk the number of the caller and the number he asks for, and in two seconds the connection is made unless the party asked for is busy at that time. In case he is, the check with the numbers is stuck upon a hook and is next in turn on that table. In the meantime others are coming in and the work goes on As soon as the caller rings 'off' the plugs are pulled from the large switch-board and placed at the bottom, ready for immediate use again. They have 537 circuits, a wire running separately to each subscriber, and today there is not a cross, a ground, or trouble of any kind in the whole system. In case people who have the telephone do not use it by noon we call them up to see if the wire is all right, so as to fix it and save our customers all the trouble and annoyance possible."

COMMUNICATION WITH OTHER CITIES.

At the five small trunk tables, three local, one to the outlying towns and the other to New York, the boys sat with their mouths to the transmitter, their ears to the receiving tube, and each with one hand holding a rubber-handled brass plug. The boys at the switch-board answer the Assistant Superintendent's call, "621 wants 342," the boy at the table on which the check has been placed turns the brass plug, which makes the connection with the small batteries supplied to each telephone, and the bells ring at the office of the caller and of the person called. He listens until he hears them in conversation, pulls out the plug and is ready for the next.

In an adjoining room are forty burglar alarms connected with the banks, insurance offices and many of the jeweler's stores of the city. If the wire is shortened or lengthened, or in any way changed, a needle moves to the right or the left, closing the circuit and ringing a bell. If it is broken entirely the bell rings and men, who are always kept ready, start out immediately to see what is the trouble.

The Boston Telephone Exchange.

Our Boston correspondent sends us some additional interesting details concerning the late fire there, showing that a much greater amount of reconstruction work was required than one would realize at first glance, and the notable manner in which it was done is worthy of record, as we have briefly mentioned before.

Over one hundred persons were engaged night and day from Saturday morning the 12th inst., until Wednesday the 17th, in repairing the lines running into the New England Telephone Company's office, at 40 Pearl street. At two o'clock on Saturday morning every one of the two thousand wires which center in the office were severed by fire; on Wednesday morning they were all re-united and communication again opened over all the lines. In reaching this result the Telephone Company has performed a feat unprecedented in the history of electric communication, and it may be interesting to know what were some of the difficulties to be overcome, and how the thing was done. The actual work of the fire was confined to the cable-house on the roof, and the space above the operating room, which is on the fourth floor of the building; but the switch-boards were much injured by water, plastering from the ceiling and carbon from the charred beams. Every one who has noticed the network of wires in all the business portions of the city of Boston can readily understand the nature of the mass that centers at No. 40 Pearl street,

The apparent number is there somewhat reduced by some 10 cables, containing 50 wires each; but even then the view from the roof is utterly bewildering to the unpractised eye. It is well known that every telephone has a number by which the subscriber is called, and which determines its place on the switch-board. In addition to that, each one had a line number marked in the cable house which showed the place of the line on the roof structure. This last series of numbers was entirely obliterated, as the interior of the cable house was only a mass of charcoal. It was at once plain to the officers of the company that all the connections between the roof and the operators' tables must be removed and replaced by new cables and covered wire. General Manager, Loren N. Downs, at once ordered 4,000 feet of fifty-wire cables, and about 40 miles of covered wire from the factory of Eugene F. Phillips, of Providence. This was promptly forwarded about noon on Saturday by special messenger on the express train.

All the available force of the Boston and suburban exchanges was now set at work to clear away the ruins and prepare for re-connecting the lines. As all the line numbers were destroyed, men were stationed outside upon the roof structure to count the wires and communicate with those outside, that the connections might be properly made. They were maintained there in reliefs night and day, being furnished with warm food and drinks at the office, and enabled to work at night by means of two powerful electric lights furnished by the Brush Electrical Light Company; and here it might be said that all the electric light companies of the city tendered the services of their men to assist the telephone people if required. The first connections made were the special wires for calling expresses. Boston has a unique service in this respect, as there are over 400 regular express-es running into the city, which are connected by special calls with 500 customers separate from the regular exchange list. These were already for use on Monday morning. The switch-boards were not injured by fire; but, in spite of long canvas tents which were soon erected over them, they became filled with small particles of carbon from the charred timbers of the ceiling. The carbon being a conductor, had a tendency to unite all the lines in each board, and make their proper working impossible. The boards also were thoroughly soaked by the deluge of water to which they had been treated by the fire department, and by which alone the building was saved from utter destruction. The apparatus is made of carefully kiln-dried wood, as any shrinkage or warping will cause a displacement of the metallic parts, and the difference of a fraction of an inch on the board may cause a difference of ten miles in the destination of the speaking voices. Extra stoves were set up, and bricks heated and applied to dry the apparatus, and when thoroughly dry the carbon dust was blown out of the switch-boards by bellows and a powerful rotary blower. In one place a stream of melted lead had poured down upon two or three tables; this was carefully picked out before the apparatus could be used. By a careful estimate it is found that there are about 500 miles of covered wire in coils and connections at the main office. In refitting the exchange several hundred thousand joints were united, the most of which were covered carefully with insulating tape.

The work was done under the able direction of General Manager Loren N. Downs of the New England Company, Superintendent David B. Parker of the Boston division, and John J. Carty, superintendent of the operating room, whose intimate knowledge of the details of the wires was of great service. Messrs. Vail, Lockwood and Gilliland, of the American Bell Telephone Company, furnished timely direction and counsel, and all worked with keen eyes and willing hands to make the interruption of communication short as possible.

"There is danger in the electric wire," remarked the criminal when overtaken by a telephonagram.

The Postal Telegraph Bills.

The Senate Committee on Post Offices and Post Roads has informed the President of the Western Union Telegraph Company and all others who desire to be heard on the subject that it will close general consideration of the bills establishing a postal telegraph system on Jan. 31. The committee now has under consideration the bill introduced by Mr. Edmunds, and that for the same purpose put in by Mr. Hill, its Chairman. Thus far, the only person who has addressed the committee is Senator Edmunds, who earnestly advocates the measure proposed by him. Several persons, however, have expressed a wish to be heard in opposition to a telegraph system, and will be given hearings between now and the end of the month. Next, the committee will take up the Edmunds and Hill bills in detail, and decide which, if either, it will report to the Senate. It is understood that the committee proposes to bring in some sort of a postal telegraph bill, although it may reject the measures now before it and prepare a new bill. Several Senators are known to be in favor of a postal telegraph system, and it is believed that a proper measure looking to that end will stand an excellent chance of passing the Senate. There will probably be considerable debate, however, as to whether the Government shall purchase existing lines, or build independent lines of its own.

Just three days after the Boston Central Office was burned out and over 3000 subscribers left without service, the exchange was completely rebuilt and the usual connections made. During this time fifty new office cables were run from the switches to the roof, tested and tagged every conductor (50 in. each) and connected each conductor with its respective line wire on the fixture. The water, moisture and dirt were cleared out of forty sections of switch. They also cleaned and repaired all the telephones and transmitters connected with the switches, and, in fact, did everything necessary for communication as formerly.

The citizens of Boston are loud in their praise of the energetic manner which general manager Downs and his able assistants have displayed in pushing this matter through, and it is said that the subscribers, after having been even for so short a period without the services, now express their appreciation of its value in unmistakable terms.

C. F. Annett, the genial General Manager of the Rocky Mountain Bell Telephone Company, was, at the last meeting of Directors held at Salt Lake City on the 10th inst., elected Vice-President also, in place of A. J. Pattison, resigned.

The other officers of the company are J. J. Dickey, President; Geo. Y. Wallace, Treasurer; L. B. Moore, Secretary.

Editor Electrical Review:

DEAR SIR—You do me the honor to request a copy of my letter to you, of some time since, concerning some changes made by me in the switchboards in our central office.

Briefly, by substituting wooden plates for the iron ones to which the "ring-off" magnets are attached, I reclaimed twelve cards that had long been out of service on account of crosses between them. Escapes that had been attributed to "induction" were also remedied at the same time.

In our warm, damp location, rust is a fruitful source of trouble. I charge the crosses to destruction by rust of the insulation of the helixes of said magnets.

I have just completed the re-arrangement of our duplicate boards and gotten rid of another source of profanity—on the subscribers' part—managers never "cuss."

Formerly the duplicate boards extended out from the regular switch in sort of desk form, with mouth of spring-jacks upwards; dust settled therein, and every morning from eight to ten subscribers were found suffering from the interposition of a grain of sand or a shawl raveling between themselves and the attentive operator.

By inserting the duplicates beside the regular numbers on the original boards, I have escaped that difficulty without discarding the duplicates, by means of which three operators can attend to four hundred subscribers with ease and rapidity, each having every number within reach, and making any connection desired without assistance from another. A large part of the credit of introducing the duplicate spring-jacks, as applied to these switchboards, is due to Mr. T. W. Milburn, formerly manager here and present district superintendent. He approves my rearrangement of them.

Respectfully,

G. W. FOSTER.

Galveston, Tex., Jan. 2d, 1884.

East India News.

CALCUTTA, East India,
7 Council-House street,
11th December, 1883.

Editor Electrical Review.

DEAR SIR,—I think, now that the International Exhibition here has been formally opened, a few brief notes about it and its contents may be interesting to some of your numerous readers.

The opening ceremony, which was to have been one of the most imposing spectacles ever witnessed out of Europe, resulted in a perfect "fiasco," owing to the most unusual behavior of Mr. Jupiter Pluvius, who sent us a perfect downpour of rain to represent him and damp our already much-abated ardor.

The ceremony took place in the large quadrangle of the Indian Museum, marked on the plan I have already sent you as the "Grand Hall for Ceremonials," which, as we never expect any rain at this time of year here, was only covered by a handsome awning of the French national tricolor cloth—that had cost some hundreds of pounds sterling—as a protection against the sun.

On the east side of the quadrangle a marble dais had been erected for the Viceroy and the other officials to stand on during the "show," covered by a large crimson-velvet canopy, surmounted by the Viceroy's coat-of-arms, which was supplied by a local manufacturer. The rest of the hall was filled by chairs for the public, and a raised stand for the chorus singers.

Proceedings commenced by the choir singing an *Italian* chorus, which, by the way, must have been very edifying to most of those present, who were all *standing* on their chairs with umbrellas over their heads, to guard their finery against the rain, which was commencing to drip—or pour, more properly speaking—through the tricolor awning. Then the Lord Bishop of Calcutta blessed the Exhibition (so I am told) by a perfectly inaudible prayer, after which the Viceroy began the speech, in which he declared the Exposition open. When he was about half-way through it began to get dark, and the electric light was started, which, however, only sputtered for a few minutes, and then went clean out, and could not be induced to commence afresh; this left them to terminate their speeches, &c., in total darkness, and to go home to their dinners in anything but an enviable frame of mind.

The electric light was supplied by the Indian Electric Light Company (limited) of Paris, who use the Jablokoff & Siemens lamps, with Gramme generators, and they attribute their failure to "*the wires having become damp, a circuit was established between them which caused them to fuse.*"

They, however, have been trying ever since then—the 4th instant—to get some of their lamps working, but have only succeeded in making one Siemens lamp, which is situated about twenty yards from their station, to burn *at all;* notwithstanding they have three engines, making in all about 50-horse power, and about seven dynamos of all sizes.

I am sorry I have run myself short of time, so shall not be able to finish this letter till next mail. In the meantime, wishing you and your paper every prosperity during the coming year, and hoping that all my brethren—if they will allow me to use the term—in the New World will meet with every success during 1884,

I am, very sincerely, yours,

BENGALI.

TELEGRAPHIC

The inventors of the telegraph and the telephone both had mute wives. Just see what men can do when everything is quiet.

Mr. John E. Zeublin, superintendent of the sixth district of the Western Union Telegraph Company, has resigned to accept a position as general superintendent of the Baltimore and Ohio Telegraph Company.

Cable for Tonquin.

A Reuter's telegram, dated Paris, December 29, says: "The Minister of Posts and Telegraphs has ordered 3,800 meters of submarine telegraph cable to be forwarded to Toulon, of which 2,000 meters are intended for Cochin China, and 1,800 for Tonquin. The cables will be dispatched from Toulon by the first transport leaving next month."

Submarine Telegraphs.

The general public little realizes the steady extension of the submarine telegraph cables. There are now over 80,000 miles of them at work, representing a capital stock of about $170,000,000.

There are nine cables across the Atlantic, and a fleet of twenty-nine steam vessels are in constant employment in laying, watching and repairing cables.

The Marseilles-Algeria Cables.

The three submarine cables which unite France and Algeria are becoming insufficient, owing to the frequency of the telegraphic communications between Paris and the colony. To increase the capacity of these lines, the manager of the Marseilles office and an employe, M Brabié, propose to transmit recorder signals by mechanism, adapted from the Wheatstone system, instead of by hand, as at present.

Paper Electric Insulator.

An Electric Insulator is now constructed of paper pulp. Liquid silica, or silicon, is used as a cementing agent, and when these constituents are combined in proper proportion, a superior insulator is said to be produced, covering, at once, all the ground heretofore almost monopolised by the different forms of glass. This improvement is the subject of a patent recently granted to Chas. C. Hinsdale, Cleveland, Ohio,

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Telegraph Company Incorporated.

The certificate of incorporation of the standard Multiplex Telegraph Company was filed in the County Clerk's office on the 15th inst. The lines of the new company are to run out of this city East, West, North and South, throughout the United States. Its capital stock is $2,500,000, divided into 25,000 shares of $100 each. Provision is made for the increase of the capital to $10,000,000. The corporators of the company and the number of its shares held by each are: McLauren F. Pickering, of Boston, 2,583; Wandell Goodwin, of Boston, 2,583; Frederick P. Jones, of Boston, 2,583; Henry D. Manson, of New York, 2,583; Frank W. Jones, of New York, 85; H. W. Jones, of New York, 2,083; Patrick B. Delaney, of New York, 6,250; Edward A. Calahan, Brooklyn, 6,250.

The Gold and Stock Telegraph Company brings suit in the Superior Court to set aside a contract made on the 9th of November last, between the Pacific Bell Telephone Company and the Sunset Telephone Company to extra telephone business on the Pacific Coast under patents granted to the American and National Bell Telephone Companies; that the shares of the Sunset Company issued to the Pacific Company be surrendered to the former company and canceled; that the Pacific Company be enjoined from parting with 5,030 shares of the Sunset Company stock, and that Messrs. Ladd, Gorham, Yost, Powning, Hubbard and Hyde be enjoined from acting as directors of the Pacific Company upon any question which shall arise in which the Sunset Company is interested.

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We extend to manufacturers of electrical apparatus an invitation to send to this office any and all facts concerning their business which will be of interest to the public. We make no charge for publishing news.

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National Telegraph Projects.

The bill presented to Congress last week, authorizing the Government to go into the telegraph business, or rather authorizing the Government to guarantee to a little syndicate an undisturbed monopoly of the telegraph business, furnishes additional proof of the monumental presumption of the monopolist, besides being somewhat "thin" for such cold weather.

While suffering from the rapacity of the wolf, we are calmly asked to seek safety in the den of the royal Bengal tiger.

We should like to inquire what the public is expected to gain by the success of this very neat little game.

It has been alleged, and we think there is much truth in the allegation, that, under the present system, viz.: that of the Western Union, the rates are too high. But we have at least an efficient service. Yet the ingenious persons behind this bill inform us that, if they are protected in a monopoly, the lowest rate for a single message will be fixed at twenty-five cents, and they can give no guarantee of an efficient service. Would they be good enough to inform us where the benefit to the public comes in?

"Now," said the white man, who had shot a crow, to the Indian who had bagged a rabbit, "either you take the crow and I'll take the rabbit, or else I'll take the rabbit and you can take the crow!" "But," protested the Indian, "you didn't say 'rabbit' to me once!"

So it is with the public. Whether the new company or the Western Union has a monopoly, the public it seems is to get "crow" just the same.

The very logical, if not constitutional, reasons which stand in the way of the State going directly into the telegraph business have apparently induced the would-be incorporators of the new scheme to find a way out of the difficulty, by getting the Government to guarantee them a monopoly.

On the other hand, Senator Edmunds, of Vermont, with a fair if not strong backing, is for a Government telegraph out and out. On Thursday last he appeared before the Senate Committee on Post-Offices and Post Roads, of which Mr. Hill, of Colorado, is Chairman, and made the first statement in behalf of the measure.

He said he was perfectly satisfied that Congress had the constitutional power to do what was proposed, and in any of the forms that were proposed under several constitutional heads such as War, Post Office, and he might add Finance, on the same principle that the Supreme Court held that the National Banks were constitutional, although all the constitution said was that Congress might borrow money, might have a Treasury Department and might levy taxes, and, therefore, presumably Congress might have the power to provide the means to carry on the fiscal operations of the Government. In regard to a government telegraph, he thought the constitutional question beyond all dispute. The people who are engaged in telegraphic operations, just as the people who have been engaged in express and transportation operations feel a natural solicitude, of course, that their business should not be competed with by the exertion of any function on the part of the United States.

They argue, he says, that it is unjust to them that Congress should enter the field of what they call competition with private business. But if he was right in what he had said respecting the inherent constitutional power of Congress and the inherent public policy of doing this thing, for the reason that he had stated, then the argument of these gentlemen engaged in that sort of business falls to the ground, because they have known the constitution of the Government and the public objects that it was bound to promote all the time, and that whenever Congress saw fit to enlarge the postal establishment in order to facilitate its war and commercial and financial operations, to exert the powers that belong to it by the constitution, it must necessarily do so without regard to the manner in which it would affect private interests in doing the same thing that Congress finally thinks is best to do itself and for the advantage of its own people. For instance, it might have happened, and he was surprised when he looked back at the history of the country that it did not, that for the first twenty-five years of the existence of the Government all post-office operations were carried on by private hands. He could not now remember how late down in the progress of affairs it was before Congress passed the act prohibiting the transportation of letters by private hands and compelling their transportation by mail. But in this condition of the country at that time it would have been perfectly natural that the transportation of such intelligence as could be transported at that time in that way alone by letters and printed papers, should be carried on in many sections of the country at private cost and as a private enterprise. Yet he supposed that nobody would contend that had it been so, Congress would not have had the power to take the matter into its own hands whenever it considered it wise to do so under the conditions of the country, and nobody would have had any moral, and of course he would have had no legal, ground of complaint that Congress had set up a post-office establishment. So that it did not appear to him that there was any just ground for this corporation—"I will say corporation, because it comes to that—there is only one in the country amounting to anything, and, like Aaron's rod, it swallows up all the other rods that appear upon the surface of the earth. I say it does not appear to me that there is any just ground for this corporation to complain that Congress is doing something that is injurious to its private interests—not the slightest. But if it did, it is the natural consequence of carrying on the government. It is within the exercise of its just and intrinsic powers, and, of course, if we have not those intrinsic powers, that is the end of it. In carrying on these intrinsic powers, if particular interests are for the time being injured, no one has any right to complain."

This was a happy illustration of the tendencies of the Western Union Telegraph Company, this comparison with Aaron's rod which swallowed up all the other rods.

It is a very serious question, however, if Senator Edmunds would be sustained by constitutional students in his interpretation of the powers of the Government.

It is within the power of the Government to maintain the strict inviolability of the mail. Very true. Hence the Government forbids private parties from carrying on a similar business, and uses its prerogative to maintain a monopoly. This is surely logical and in accordance with the spirit of the Constitution.

But the Vermont Senator urges the Government, on constitutional grounds, not to assume entire control of the telegraph, which, if his rendering and interpretation of the Constitution is correct, it has a right to do, but instead of this, to enter into competition with private parties, in the hope of ultimately forcing them to accept its terms for the sale of their property, and thus making them withdraw from a business which, when it was begun, they were encouraged to believe might be lawfully maintained.

It is needless and of no avail, to urge in justification of this course, that the capital claimed by these private parties is fictitious, misleading and fraudulent. The remedy for this would be through the courts. Many innocent persons are holders of the stock of this corporation. Whatever fraudulent practices may have been indulged in by the originators of the scheme, these people at least have paid for their stock in good faith, and it is difficult to see how the State could legally dispossess them without at least returning them what they had actually paid out, together with legal interest.

Such dreamers as Mr. Henry George and his disciples have attempted to formulate the principle that tracts of land that have descended from what they are pleased to call the "robber barons" of centuries ago, are not lawfully held by the present claimants, and hence a great part of Ireland, for instance, stands to-day in the name of squatters who, in reality, are little more than State tenants. But, the fact is that much of this land has been purchased in good faith by innocent persons, and that the State having virtually assented to the legality of these claims, and thus encouraged innocent persons to invest in the property, cannot legally dispossess them without rendering payment in full.

So it would seem to be with the telegraph business of this country. The right of private corporations to build and operate telegraph lines having never been disputed by the State, innocent persons have been led to invest in them, and, since it would be impossible to discriminate between those who held *bona fide* and fictitious interests in them, it is hard to see how the State, even if constitutionally authorized to enter the field as a competitor—and this would mean a total extinction of all private telegraphic enterprise—could escape from paying the market value of the bonds representing the paid-up capital of the corporations displaced.

The Senator said that his proposition was not to prohibit the transmission of telegraphic intelligence by any private person or any corporation; not to subject telegraph companies to the same rule that is enforced against the transportation of letters by private hands in the old and in the present law, he believed; but to leave them as they are established in the business, to go on and compete, and carry on their operations exactly as they did before. So that, putting it in the narrowest business point of view, we stand in no different attitude to them than would any other private corporation that might be incorporated to-morrow to set up a telegraph line anywhere or everywhere over the country. And, of course, the Western Union Telegraph Company would never think of complaining of any body of capitalists who should to-morrow procure an act of incorporation (as they can under the laws of many of the States without even going to the Legislature, under general laws which provide for the formation of corporations) to carry on the telegraph business, and it has been done, of course, over and over again; and those the Western Union Company has bought out or traded with or pooled, or something of that kind. So that, even in the narrowest point of view, the United States cannot certainly be said to stand in any worse light with respect to engaging in this enterprise than private persons would. The only difference would be that, whereas the private man may be "squeezed" by cutting rates, may be "frozen out" or bought up or pooled with, so as to create an actual monopoly—not only the prices of intelligence, but what kind of intelligence shall go, and when it shall go, and under whose control—the only difference, he said, would be that, whereas they can treat and deal with rival companies, they could not treat and pool with and cut rates and run Congress out, and that is just where the line is drawn really, he supposed. It seemed to him for the best interests of the country that any appliance with which its welfare is so intimately connected as is the instantaneous transmission of intelligence, should be subject to no censorship, to no corporate man's will, to no question of how it is going to affect stocks or the standing of corporations or of persons, but it should be free to all men as the post-office is, and subject to no more espionage than is the post-office. It is essential, he believed, at this time to the interests of the United States, and growing more and more so in connection with great social questions and the aggregations of vast sums of money under corporate power, that this business should be taken in hand by the Government on the constitutional principle stated; should be undertaken independently and subject to no contracts or arrangements with parties.

It seems somewhat astonishing that an able man like Senator Edmunds should attempt to compare on equal terms the condition of things which would prevail as between the Western Union Company and another similarly organized company, and the Western Union as opposed to the United States, backed by the National Treasury.

As we know, the national postage was reduced quite recently from three to two cents, because it was found that the Postal Department was showing a *profit*, whereas the people are supposed to furnish only sufficient money to pay the expenses of the several departments, which are not looked to for returning any profit.

Therefore it is hardly fair to maintain, as does Senator Edmunds, that the Government would only stand in the position of any other competitor in the telegraph business, because the government could afford, and indeed it would of a necessity be its aim, to carry on the business for a fee which should be only sufficient to pay the expenses of the service, whereas corporations like individuals could scarcely be expected to risk their money without substantial reward.

No candid man will deny that the Senator makes a very strong point in favor of Government control of the telegraph, however, when he says that the telegraph should be subject to no censorship, to no corporate man's will, to no questions as to how certain despatches are going to affect stocks or the standing of corporations or of persons—in fact that it should be as free from espionage as the Post Office now is. This is undeniably the truth, and may be safely looked upon as the one and only strong argument in favor of Government control of the telegraph under a Republic.

The wisest and most prudent method of constructing a government telegraph, says the Senator, would be to avail ourselves of whatever force of people in the pay of the United States we are possessed of. We have a corps of engineers in the army who are engaged in doing engineering and practical building work of various kinds in connection with rivers, harbors, forts and arsenals, levees, dykes, canals, locks and the like, who are now employed at the expense of the United States, holding life places, and with ample material in the way of skill, learning, honor, probity and intelligence—everything that goes to make up a good administrative system of doing something on the face of the earth.

If we were to provide for putting the construction of these lines into the hands of the engineer corps we should thereby make a great saving in point of economy, in the expenditure of money, and at the same time have no jobbery in the way of contracts; have no peculation of funds because, he was bound to say for the engineers, that through the whole history of the Government the per centage of money lost to the United States in the disbursement of public moneys at the hands of the engineer corps of the War Department has been smaller than in any other branch of the public service, and he believed smaller—although he could not speak by the book as to that—than in any branch of any public service of any country in the world. It almost never happens that any of these gentlemen who are graduates at West Point in the corps of engineers, charged with disbursement of public funds, have defaulted one cent. His plan would be, as one best suited under all the circumstances, as he had suggested in the bill that he had the honor to introduce and which was before the committee, to have a board composed of three of those gentlemen to establish four leading lines, trunk lines, just as if there was not a telegraph line in the world at this time.

We begin, just as we did the post office in old times, to construct north and south, east and west, some great arms or trunks, from which branches may go from time to time as money shall be appropriated and as there shall be use for the same.

Senator Edmunds' plan is to start four trunk lines, making in all from 5,000 to 8,000 miles.

Such a course would seem to be unjust in the extreme, for the Western Union, with all its faults, runs its lines into hundreds of small towns, in many cases at a loss, and for the State, which is supposed to have the public weal at heart, to operate only trunk lines between good paying centers, while expecting a private corporation to look after the losing part of the business for the sake of accommodating the public, would be unreasonable and unfair.

The president of the Western Union Telegraph Company has written to the chairman of the committee asking him when he can be heard at length in support of the views of his company. It is understood the committee will reply to Mr. Green and to all others who wish to be heard in opposition to the proposed Congressional legislation, that they shall file printed copies of their argument, and if, in the opinion of the committee, further information is desired, then they may be heard briefly by counsel. The object is to prevent unnecessary delay in perfecting a bill so that the matter may come before the Senate with the least possible delay. It is said that a majority of the Post Office Committee is in favor of reporting a bill which may be perfected during debate in the Senate, where amendments are always in order.

The strongest argument against a bill of this kind may perhaps be thus briefly summed up. 1st. The unconstitutionality of the State appearing in the commercial field, in the role of competitor for surely the same arguments might be advanced in support of a national control of the railway system as of the telegraph, and if this inclination be once indulged it may lead no one knows where until the State shall become the rankest monopolist of them all. 2nd. The great danger to popular government is an increase of an already too large a civil-list. For, if the number of office holders be much further augmented, the time is not far distant when it may become impossible for the people, who are sovereign, to defeat the chief of a party when once in the presidential chair owing to the multitude of office holders who must, of a necessity, be his retainers, though paid by the very people whose wishes they thwart.

It must be said, however, that a bold assumption by the Government of the control of the telegraph is much to be preferred to the bill reported early last week, wherein the Government is asked to protect a small body of capitalists in a monopoly of the telegraph business of the country, for then the public now only in the frying-pan would be forced into the fire.

A Suppositious Case.

The Belgian Chamber of Deputies was set afire the other day by a defective gas main, and despite the efforts of the firemen, this magnificent pile was almost totally destroyed.

Our esteemed contemporary, *L'Electricite*, uses this unfortunate occurrence to illustrate the inefficiency of the Paris fire brigade, on the workings of which the Belgian system is founded.

We are disposed, however, to use the incident to point an altogether different kind of moral.

The Belgian and French journals, in describing this terrific conflagration, content themselves with the simple statement that the fire was caused by a "defective gas main." In other words, since buildings are not infrequently set afire by illuminating gas, there is nothing at all strange about such an occurrence, and no alarm is occasioned.

But let us suppose that the Belgian Chamber of Deputies was set afire by a defective electric main instead of by a defective gas main. Would the mere statement of the fact be sufficient for the sensation seekers? By no means. It would have been heralded far and near that the Belgian Chamber of Deputies had been set afire by the electric lighting wires; that the subtle current had defied the skill even of experienced firemen. The conclusion drawn from the occurrence would no doubt have been that no building was safe while the electric lighting wires were permitted to enter its portals. The electric light companies might have exhibited the official records to prove that no fires of a serious nature had ever before been directly attributable to the electric wires, but in vain. They might have protested against the unfairness of a general condemnation of electric mains, which had caused one fire, while gas mains, constituting a standing menace to the security of both property and life itself, were regarded with indifference. They would have been laughed at for their pains, and their only answer a redoubled outpouring of double-leaded head lines informing a timorous and not always thinking world that it was in momentary danger from the electric wires.

But the Belgian Chamber of Deputies was set afire by a defective gas main. That is sufficient. It is not necessary to dwell upon such an occurrence because, since it is frequent, it lacks novelty. In fact, Reuter's European Press Agency did not consider the fact that a gas main caused the conflagration of sufficient importance to mention it, and hence it was that the cablegram brought to us only the most meagre information—such only as could be gathered from the words:

"*The Belgian Chamber of Deputies has been destroyed by fire.*"

That was all!

But let us suppose, as said before, that it was an electric main that caused the conflagration. Reuter's Agency would have bestirred itself. Economy would have been thrown to the winds, and we should have had something like this:

"*The Belgian Chamber of Deputies has been destroyed by fire. An electric lighting main the cause. The firemen struggle heroically with the flames, but are met on every side by bluish tongues of electric sparks—in some cases six feet long—which proceeded from the electric wires. Many firemen were badly injured by the vandal electricity. Had the fire been started under ordinary circumstances the firemen say they could easily have extinguished it, but, since the terrible agent which caused it, maintained it, mortal exertion proved ineffectual and availed nothing, until the magnificent structure was a heap of unrecognizable ruins. The Government is about to have electric wires removed from all public buildings.*"

No such despatch as this was sent; it is entirely imaginative, and intended, as said before, only to illustrate what an important difference it makes "which dog belongs to the tail that is pulled."

There are doubtless some amongst the readers of the REVIEW who will think this imaginative dispatch is exaggerated. We assure them that, on the contrary, such is not the case. It is mild, very mild, when compared with the qualities which have recently been attributed to the electric lighting wires by a certain portion of the daily press, and we hereby challenge any man to show that the contrary is true.

To continue and to develop our suppositious case, we will now suppose that such a despatch as this which we have purposely made up, had been received here. A daily contemporary of ours, which has become the people's champion because the monopolists, who were its first choice, refused to support it, would have disturbed the tranquil night with blasts of two-fold fog-horn intensity, and broken into the fair day with brays of quadruple donkey-power.

"Haven't we said so all along?" would be the burden of its song, and with the same contempt for natural laws and fair play which it recently exhibited, and continued to display until it was laughed out of countenance, we should have an editorial comment something like this:

"A WARNING FROM BELGIUM.

"The cable announces this morning that the Belgian Chamber of Deputies was destroyed last night by fire, caused by an electric main We sounded the warning some weeks since, and gave a lucid technical explanation of the many dangers which threatened the firemen when dealing with burning buildings to which electric mains were connected.

"The cable says that sparks six feet long darted continually from the arc wires, whenever the firemen attempted to extinguish the fire. This may safely be taken as a low estimate of the length of these sparks. In order to maintain the high reputation for veracity which all news agencies enjoy [it was proved in a London court recently that the City Press agency made three columns and a half out of a Canadian dispatch of fourteen words] Reuter's Press agency reports the sparks from the wires as only six feet in length. We have little doubt that a careful examination will show that the sparks were nearer *ten* feet in length than five, and in some cases that they were even more than this.

"The dispatch says nothing about an attack on the firemen by the electric current from the wires, but doubtless we shall shortly get the particulars of that. No doubt many firemen were seriously, possibly fatally, injured by the electric current running down the streams of water from the hose, and no doubt many a poor family is mourning the loss of a father and husband who, fulfilling his duty as a fireman was struck down in the heyday of his youth and vigor by that terrible force—electricity. We can almost see those poor fellows, the firemen, struggling with the fire in the midst of what might not inappropriately be called lightning strokes from the electric mains.

"Rather a thousand times that we go without light, if necessary, than that we attach these terrible electric mains to our dwellings and offices. Let us go back to kerosene oil, with all its horrors; let us return to the farthing dip of our progenitors; yes, a farthing dip stuck in the neck of a black bottle; aye, a bottle of sack, leastways where sack has been, rather than meddle longer with that insidious, minaceous, mortiferous, virulent, venomous, deadly force, otherwise known as electricity."

Now, the daily journal in question did not thus comment, for there was no occasion for it, since the Belgian Chamber of Deputies was fired, not by electricity at all, but by a defective gas main. We were only trying to reproduce what this journal—we judge from its recent exaggerations concerning electric mains—might reasonably be expected to say, should the aforementioned conflagration have been caused by the electric mains.

The assertion may be based on the fact that though it was admonished upon the appearance of its first article that it was permitting itself to be led by unscrupulous persons into the most ridiculous pitfalls of physical science, it yet kept on. But this seemed only to whet its appetite for still more untenable positions, to urge it to make a still more aggressive stand. The certain and obstinate opposition which, we may observe, made to confutation, however clear, and to reproof, however just, is an undoubted argument that some dormant privilege is thought to be attacked; for as no man can lose what he neither possesses nor imagines himself to possess, or be defrauded of that to which he has no right, it is reasonable to suppose that those who break out into fury at the softest contradiction or the slightest censure, since they apparently conclude themselves injured, must fancy some ancient immunity violated or some natural prerogative invaded. To be mistaken, if they thought themselves liable to mistake, could not be considered as either shameful or wonderful, and they would not receive with so much emotion intelligence which only informed them of what they knew before, nor struggle with such earnestness against an attack that deprived them of nothing to which they held themselves entitled.

We have heard of a man who, having advanced some erroneous doctrines in philosophy, refused to see the experiments by which they were confuted; and the observation of every day will give new proofs with how much industry subterfuges and evasions are sought to decline the pressure of resistless arguments; how often the state of the question is altered, how often the antagonist is wilfully misrepresented, and in how much perplexity the clearest positions are involved by those whom they happen to oppose.

The experience of ages, as we see it recorded, shows conclusively that we are wont to regard with trepidation a novelty to which we are not accustomed, while at the same time looking upon, with something akin to indifference, that which is in every way more threatening and more to be dreaded. Thus the general public has for so many years heard of deaths and conflagrations, caused by illuminating gas, that it has grown apathetic. The public is thoroughly aware that it poisons the atmosphere, and that when the mains are out of order they spread disease

and even death with no niggard hand, and yet the father of a family calmly "draws the drapery of his couch about him and lies down to pleasant dreams."

The records show that much property is annually destroyed by a careless handling of gas, or by defective gas mains, which the strictest vigilance will not serve to detect. The loss of the grand structure which was known as the Belgian Chamber of Deputies, through the ignition of vagrant gas, is but one of a series of similar calamities which annually occur wherever gas is used.

Of all the evils which beset our present civilization, it is not unreasonable to believe, from the proof at hand, that the use of gas in dwelling houses is by far the worst. We have been liberally furnished with pure air, and yet for the sake of convenience we permit it to be poisoned. Illuminating gas is a standing menace to life and property. Electricity is the agent which surpasses it, both in point of convenience and as an illuminant. Our contemporary, *L'Electricité*, very truly says that it has only been in extreme cases and under peculiarly favorable circumstances that electricity has ever set fire to anything, and when the electric mains are properly arranged it would be almost impossible for it to do so.

Compared with much of the illuminating gas of the day, the evil done by ancient hydras was insignificant, and Orpheus, Homer, and Hesiod imagined only the chimera. Like the octopus, it has no muscular organization, no menacing cry, no breast-plate, no horn, no dart, no tail, with which to hold or bruise, no cutting fins or wings with claws, no sword, no venom, no talons, no beak, no teeth. The tiger can suddenly devour you, but the illuminating gas can slowly poison you to death.

The Baxter Electric Light Company.

The permanent organization of the Baxter Electric Light Company took place last Wednesday, the 16th inst., with a capital of $2,000,000, in shares of $25 each. In a previous issue of the REVIEW can be found an interesting description of the Baxter lamps, for which is claimed great economy in the use of carbons, and so far as practical experiment has gone, it would seem that these claims can be sustained. The company have secured, in addition to the lamps, a complete system of electric lighting, and are now ready to negotiate for territory and the organization of subsidiary companies. Mr. Edward A. Quintard, President of the Citizens' Savings Bank, has been elected President of the new company, and Mr. Henry Altman is Secretary.

TORONTO, CANADA, November 30.

Editor of Electrical Review:

DEAR SIR: Will you please define the following:

I.—1st. Electro-magnetic induction. 2d. Electro-static induction. 3d. Electro-dynamic induction, as applied to telegraph wires.

II.—On parallel wires, is the induction inversely as the distance, or inversely as the square of the distance?

And oblige, AN OLD SUBSCRIBER.

ANSWER:

Electro-magnetic induction is the power which an electric current traversing a conductor has upon non-magnetized iron, to transform it into a magnet.

The ordinary electro-magnet is a good example of electro-magnetic induction. We surround a bar of soft iron with a coil of insulated wire, and then pass an electric current through the coil, the current thereupon producing magnetism in the iron.

Electro-static or static induction is the influence which any electrified body has upon all conducting bodies in its immediate vicinity, although it does not touch them. For example, if we excite electrically a glass rod, and then hold it near a gold leaf electroscope, the leaves will separate from one another; or, if we electrify a plate of hard rubber, and hold it a couple of inches above the hair of the head, the hair will at once stand on end, being inductively electrified. It must be remembered that an electrified body always induces the electricity of the opposite sign to itself, on the side nearest to the inducing body, repelling the electricity of like sign to the most distant point.

The effect of this electro-static induction in telegraph wires is as follows:

When a current is sent into a line, it is made sluggish and retarded by a charge of opposite sign, which it, by virtue of its electrical condition, excites in other wires, which charge again reacts on the first wire tending to hold the current inert as a charge. This reduces the speed of the current, and also unduly prolongs the signals received at the distant end, besides frequently producing what is called the return current, which is simply part of the original current escaping to earth through the same end it went into the wire. This effect is not apparent with ordinary Morse telegraphs, although it becomes very evident in the duplex, automatic, and other fast systems.

It is also the most troublesome element in subterranean and submarine wires, but in them the effects shown are much greater, because the opposing charge then is accumulated on the outside of the insulation of each wire from the earth, the induction being wire and earth instead of between wire and wire.

It is usual to speak of retardation and induction as if they were two different interfering forces, where retardation is but the result of static induction.

Electro-dynamic induction is the power which a current traversing any wire has of developing other currents in neighboring conductors.

If we have two wires extended parallel to one another, and we send a current through one, a momentary current is excited in the second wire, opposite in direction to that flowing in the first; if we now open the circuit of No. 1, a second current appears for an instant in No. 2, but this time it is in the same direction.

This effect is also seen, if the primary current is increased and decreased. Its effect on telegraph lines is not marked, except the lines are very long; but in telephone lines it is well known that the effect is to repeat upon the receivers of one line the speech uttered into the transmitters of the other.

It is sometimes made use of, however, and a familiar example is the telephone transmitter induction coil, in which the changes in the current passing through the primary coil induce currents in the secondary coil, which, passing to line, reproduce the spoken words in the distant receiver.

Electro-dynamic induction is sometimes, but erroneously, called electro-magnetic induction.

Magneto-electro induction is directly the converse of electro-magnetic induction. In the latter, electric currents induce magnetism; whereas, magneto electric induction is the development of electricity from magnets. The ordinary magneto telephone bell, or the dynamo electric machine, in which currents are generated in the armature coils when the said coils are rotated in immediate proximity to magnets, are good examples of magneto-electric induction.

Strength of induced currents—The strength of induced currents is proportional to the strength of the primary current, upon the distance of one wire from the other, and upon the length of wire subjected to the inductive action.

It is our impression that, all things being equal, the strength of the induced current is inversely as the distance.

The Electric Light for Cave Exploration.

For prolonged and minute exploration of caves, *La Lumière Electrique* speaks very enthusiastically of the adaptability of the electric lights: "Under a dome hung with curiously entangled stalactites the rays from the regulators are so arranged as to pierce the darkness of the galleries and variously-formed arches, and give the fantastic place a strange brightness, the crystallizations on the walls taking on a surprising iridescent lustre, and the damp stratum that covers the whole being transformed into a marvelous varnish." Hitherto "for making a prolonged excursion into the different parts of a cave, for examining its galleries and chambers, and for getting an exact plan of it, or for studying the constituent elements of its walls, none of the means employed in modern times has been found practical, or, at least, sufficient."

Press Comments.

ELECTRICAL REVIEW is a sixteen-page weekly journal of electric light, telephone, telegraph and scientific progress, published at 34 Park Row, by Thos. H. Delano, and edited by Geo. Worthington. This journal is devoted mainly to the comparatively new inventions of the electric light and telephonic systems, so all-important to the business world at present, and so universally used. It contains valuable information concerning the progress and prospects of these wonderful and now indispensable inventions. For business men and inventors, or those desiring to keep informed upon the progress of scientific matters of this nature, the ELECTRICAL REVIEW will prove both useful and interesting.—*The South, New York.*

Proposed Patent Office Legislation.

The American Patent Protective Association, of 39 Broadway, New York, is circulating for signatures a memorial to Congress bearing the following points:

1. That a special commission, including one or more parties of practical experience, be appointed to revise the patent law.

2. That skilled persons be employed to make a digest of all the matter in the library of the Patent Office, with abbreviations of all inventions, so arranged as to correspond with the classification in the office, so that each examiner may have everything relating to his class conveniently at hand.

3. That foreign patents, or at least drawings of such, be duplicated and classified so as to afford a convenient reference.

4. That the statute which limits the term of a home patent to that of the earliest expiring foreign one be repealed.

5. That the fee for granting patents shall not greatly exceed the expense incurred.

6 That the patent fund be forever sacred for the uses and purposes for which it was created.

7. That the Patent Office be recognized as a separate department, independent of all others, and that it be allowed so much of the surplus patent fund as may be necessary to the proper performance of its duties.

8. That the working force be increased, and such salaries as will secure efficient service be provided, and that the office of Commissioner be that of Chief Executive Officer of the Department.

9. That there be established within the office a United States Court, composed of three gentlemen of experience in law, chemistry and mechanics, to whom all appeals shall be made, and to whom shall be submitted all questions, and whose decisions shall be final.

10. Thet in view of overtures made by foreign governments, authority be given the President of the United States to conclude arrangements for the joinder of the United States in an international union for reciprocal protection and legislation for patents.

11. That a commission be established with authority to order such Patent Office expenditures, not in excess of receipts, as such commission may from time to time deem necessary.

The offices of the Telegraph Department in London, under the charge of Mr Spagnoletti, at Paddington Station, are lighted by accumulators of a kind invented by Mr. H. T. Barnett. Each cell consists of a box measuring externally 1 ft. 10 in. by 7 in by 5½ in., and divided into sixteen compartments by partitions of porous earthenware. In each compartment a lead plate is placed, and is packed in with finely divided lead. Half the plates, taken alternately, are connected to one terminal and half to the other, and when the battery is formed the expansion of the divided metal, which accompanies its oxidation, compresses it firmly between the porous plates and the lead sheet in its centre, and thus good contact is insured, while all possibility of the active metal falling off is entirely prevented. The internal resistance of such a cell is $\frac{1}{100}$ of an ohm, and its electromotive force 2¼ volts. The acid solution lies in the pores of the mass, and cannot be split by anything less than a complete upset, and even then it would escape very slowly. This feature is of special importance in lighting railway trains, a purpose the inventor has in view. In such case the plates in a box are coupled in series, so that it constitutes a battery, instead of a single cell.

Metallic feet are formed at each end, and stand upon two metal plates under the seat of the carriage. These plates are connected by conductors to the lamp, and thus the simple act of putting the battery into the carriage completes the circuit. Another purpose for which the batteries are offered is domestic lighting from a central station, to guard the user against fluctuations and temporary stoppages, and also to enable currents of high tension to be distributed, and the machinery to run both night and day. Mr. Barnett has invented an automatic regulator to cut the battery into and out of the main circuit according to the state of its charge. The essential feature of this instrument is a small cell with its plates hung on a balanced lever. These plates are under exactly the same conditions as those of the battery, and oxidize and deoxidize at the same rate. Thus they alternately increase and decrease in weight, and by this change in their condition move the beam upwards and downwards, varying the connections. The weight of a one horse-power battery cell is 55 lbs., and its price £3. It is claimed that it may be expected to last ten years without repair, and that it is the smallest, in proportion to its power, yet produced.—*Engineering, London.*

Professor Blythe, M. A., F. R S. E., of Anderson's College, Glasgow, recently delivered a lecture at Stranraer on "Methods of Producing Electric Currents," in the course of which he devoted prominent attention to the electric light. One use of the electric current was, he said, the production of the electric light. Its application in that way had been extended considerably within the last three or four years. He might say that its application to the lighting of large buildings was an accomplished fact. They had not yet got it into private houses, because the practical subdivision of the light was still partially an unsolved problem. Some new discovery had yet to be made before subdivision for general house illumination could be made. They were, however, on the right track, and he could not but believe that the electric light would in the future be in all our houses. No doubt the coal gas used just now was an efficient light, and many persons thought we did not require anything better. It was said that we had got light enough just now, but that argument was used long ago, when people used only the rushlight. They had light enough for all the purposes of that time, but directly they got gas, people put away the rushlights. The same thing would take place in the long run with the electric light. That light was a true thing, and like every other true thing it would fight its way into general recognition. For one thing, it was the healthiest light yet discovered. The burning of the electric light did not deteriorate the atmosphere; it did not consume the oxygen which human beings required to breathe, which was what the gas flame was always doing.

ELECTRICAL PATENTS

INDEX OF INVENTIONS FOR WHICH LETTERS PATENT OF THE UNITED STATES WERE GRANTED IN THE WEEK ENDING JANUARY 15, 1884.

291,866 Telephone transmitter; Emile Berliner, Boston, Mass.

291,867 Electric lamp; Thomas H. Blamires, Huddersfield, county of York, England.

291,871 Galvanic battery; Horatio J. Brewer, New York, N. Y.

291,915 Telephone circuit and apparatus; Thos. D. Lockwood, Malden, Mass.

291,944 Dynamo-electric machine; Daniel A. Schuyler and Addison G. Waterhouse, New York, N. Y., assigned to the Schuyler Electric Light Company, same place.

291,958 Electric cut-out; William M. Thomas, Grand Rapids, Mich., assignor of one-half to Grand Rapids Electric Light and Power Company, same place.

291,973 Dynamo-electric machine; Chas. E. Ball, Philadelphia, Pa.

291,996 Apparatus for moulding the sections of electrical conduits; Daniel H. Dorsett, Joseph E. Morris and Benezette Williams, Chicago, Ill.

292,022 Sound muffler for telephones; Hiram Maine, Chicago, Ill.

292,034 Secondary battery; Eusebius J. Molera and John C. Cebrian, San Francisco, Cal., said Molera assignor to said Cebrian.

292,079 Dynamo-electric machine; Jonas Wenstrom, Orebro, Sweden.

292,096 Magnetic ore-separating machine; George W. L. Carter, New York, N. Y.

292,113 Electric arc lamp; Charles H. Hayes, Ansonia, Conn.

291,115 Telephone exchange system; F. Benedict Herzog, New York, N. Y.

292,121 Dynamo-electric machine; Edward R. Knowles, Brooklyn, N. Y., and Frank E. Idell, Hoboken, N. J., assignors to the Consolidated Electric Light Company, of New York.

A printed copy of the specification and drawing of any patent to the annexed list, also of any patent issued since 1865, will be furnished by any of the patent solicitors whose advertisements appear in this journal. In ordering please state the number and date of the patent desired.

BUSINESS NOTICES.

A. C. NORTHROP, Waterbury, Conn. Iron and Brass Machine Screws, Zinc in Sheets and Plate for Electrical Purposes, Parts for Telephone and Telegraph Instruments, Manufactured from Iron, Brass, Steel or Zinc.

A. L. BOGART, New York. Electric Gas Lighting Apparatus. Annunciators for Hotels and Houses.

ALFRED MOORE, Philadelphia, Pa. Telegraph, Telephone, Electric Light, Office, Line and Annunciator Wire.

AMERICAN BELL TELEPHONE Co., Boston, Mass. Electric Speaking Telephones for Exchange Systems, Private Lines, and Speaking-tube Lines.

AMERICAN ELECTRICAL WORKS, Providence, R. I. Patent Finished Insulated Electric Wires, Telephone and Electric Cordage. Electric Light Wire, Magnet Wire, Patent Rubber covered Wire, Aerial and Underground Cables, &c., &c. Send for prices.

WM. A. HARRIS, Providence, R. I. The Harris-Corliss Steam Engines and Light and Heavy Castings.

AMERICAN SPIRAL TELEPHONE WIRE Co., Boston, Mass. Spiral Telephone Wire for long and short distance Telephoning. Write for information.

ARMINGTON & SIMS, Providence, R. I. Engines for Electric Lighting and general use.

AUSTIN GALLAGHER, New York. Keith Electric Light System complete for Arc Lighting. Stock for sale.

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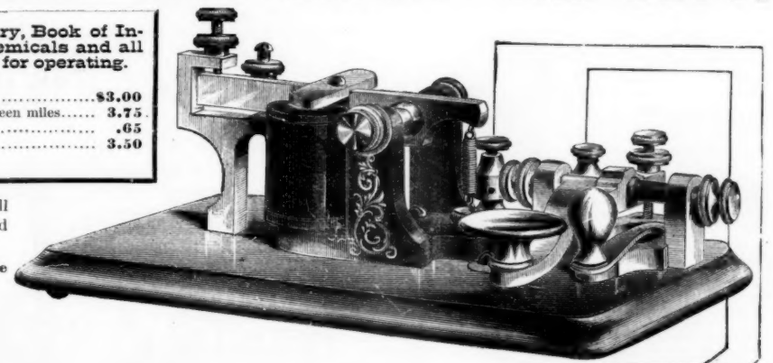

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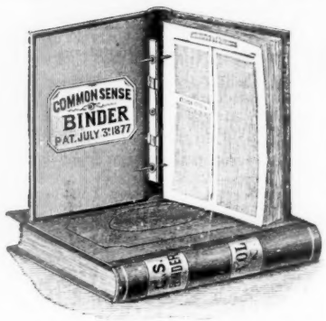

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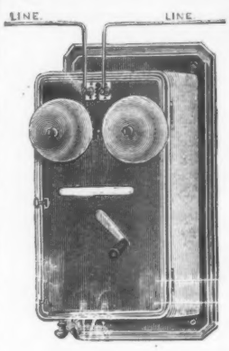

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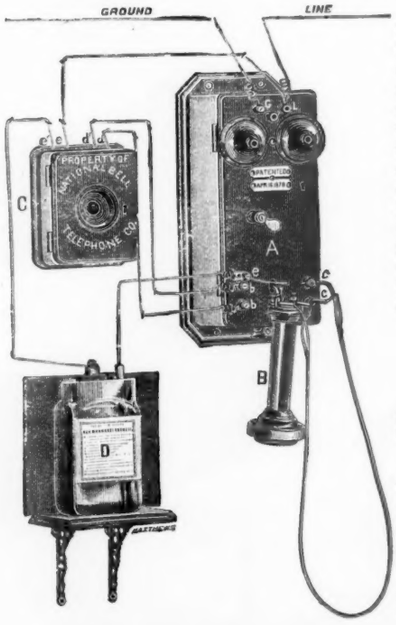

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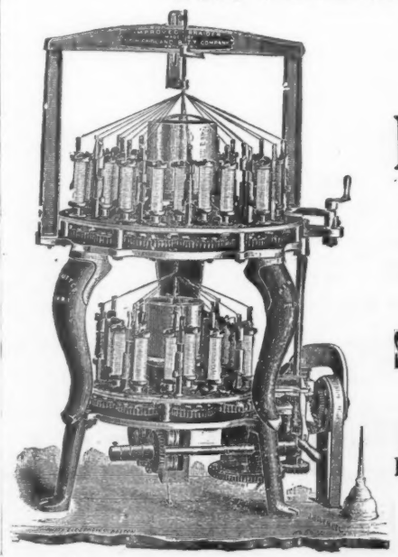

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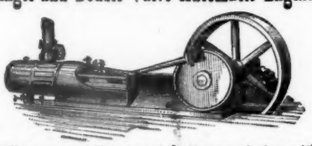

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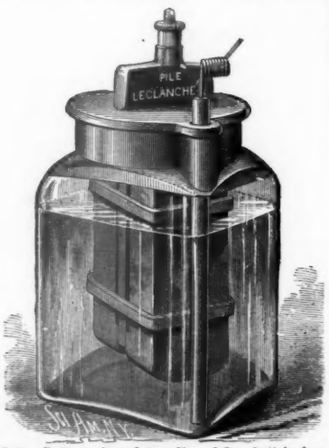

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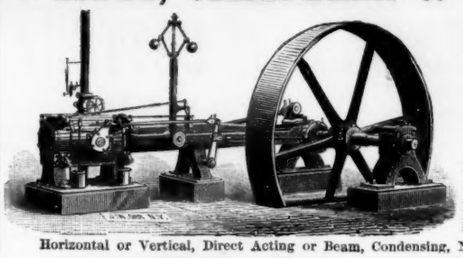

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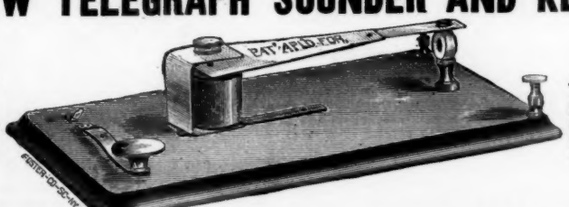

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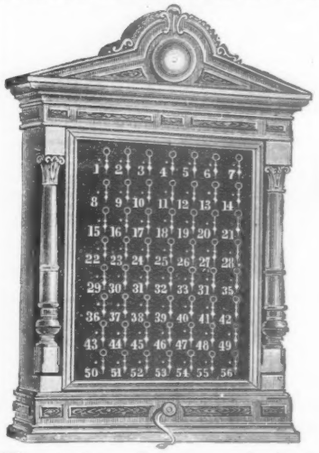

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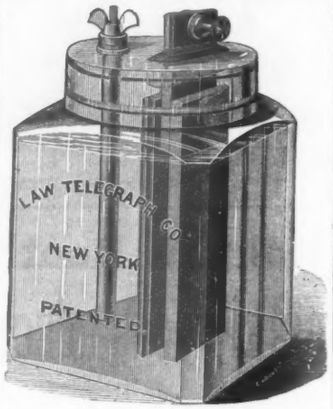

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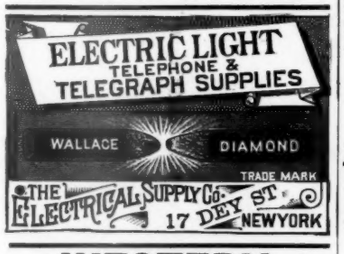

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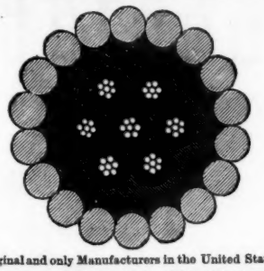

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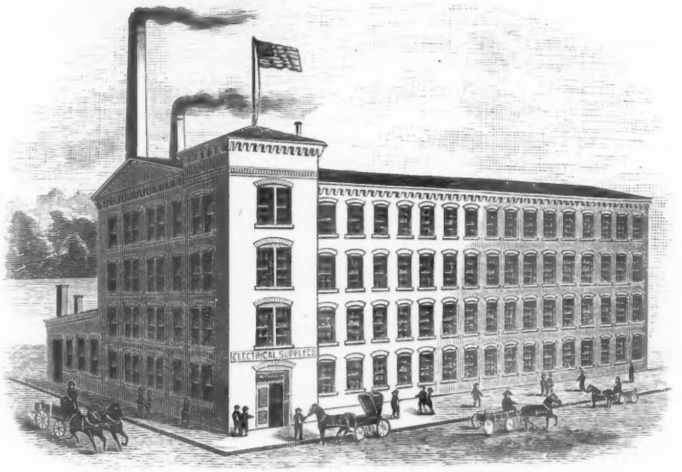

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